# Products finishing

FRED W. VOGEL, Editor

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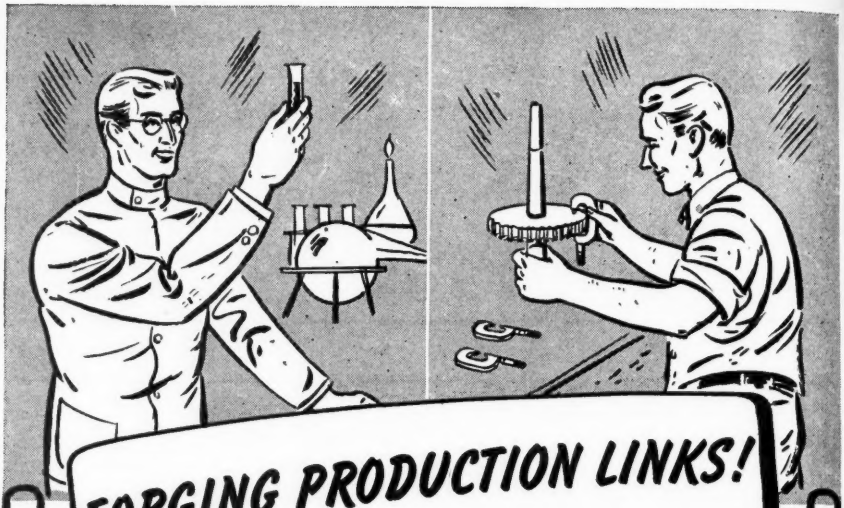

# FORGING PRODUCTION LINKS!

THERE is a story behind Cowles Alkaline and Solvent type metal cleaners. Each cleaner has been developed as a solution to a specific metal cleaning problem. War plants and arsenals requiring specialized metal cleaning processes consult with Cowles Laboratory Technicians. As a result, quicker and surer cleaners have been developed.

Capacity production and more, is demanded from our Nation's War Plants. Each link in the vital production chain must be as strong as the others, if we are to reach our production peak. Examine your chain. Can your metal cleaning, and consequently your entire production program be stepped up?

We invite your inquiries. If there is a way to speed up your metal cleaning, our laboratory technicians will find it. This service is yours for the asking.

USE LIXOL The Solvent Emulsion Type Cleaner

THE VITAL LINK

COWLES CLEANERS

THE COWLES DETERGENT COMPANY

7016 EUCLID AVENUE — Metal Cleaning Department — CLEVELAND, OHIO

# PRODUCTS finishing

THIS is your American Electroplaters' Convention issue of PRODUCTS FINISHING. In it you will find the complete educational program including abstracts of papers to be presented, a resume of activities, and pictures of places to be visited and the men and women who are responsible for the success of the Convention. This represents the sum total effort of a group of men and women who for several years have anxiously anticipated the opportunity to share the hospitality of their city with fellow members of the American Electroplaters' Society. Their untiring effort is deserving of the cooperation of every executive engaged in the field of metal finishing and attendance at this Convention will indicate your appreciation of their exceedingly fine job.

THE War Production Board has announced that metallic zinc will be placed under complete allocation control beginning June 1. J. S. Knowlson, Director of Industry Operations, issued an amended Order M-11 setting up the zinc allocation plan. He issued at the same time Order M-11-a which places zinc oxide and zinc dust under the pool arrangement by which all zinc has been controlled heretofore.

STOCKS of supplies made of aluminum in the hands of wholesalers and distributors are removed from the restrictions of the Suppliers' Inventory Limitation Order, L-63, by Exemption No. 4, announced by the Director of Industry Operations. The exemption permits suppliers to omit their stocks of aluminum and aluminum products in calculating their total permissible inventory as prescribed by L-63. The action was taken because distribution of aluminum through warehouses is already strictly controlled under Supplementary Order M-1-f.

THE War Production Board prohibited the use of copper and its alloys, including brass and bronze, in an additional hundred-odd civilian products; curtailed other uses after June 15, and ordered a number of other restrictions designed to conserve supplies of the red metal. The action was taken in a revision of Order M-9-c, issued by J. S. Knowlson, Director of Industry Operations. M-9-c originally was issued on October 21, 1941, and has been amended frequently. The latest order maintains the List "A" of the previous order in substantially the same form. Use of copper in the manufacture of articles on this list was prohibited after March 31, 1942. A new list, "A-1," is added. Items on this list must not be manufactured, assembled, or finished after May 31.

**JUNE, 1942** **Vol. 6, No. 9**

HOTEL PANTLIND

AES HEADQUARTERS

# American Electroplaters' Society 30th Annual Convention

THE American Electroplaters' 1942 Convention Committee, headed by Chester W. Smith, is to be commended on its work in preparing a convention which has so much to offer to those interested in metal finishing under present conditions. Although the convention is shortened to three days, all the important events are retained. The Educational Sessions will include the full number of papers. Production of material to bring the war to a speedy and successful conclusion is occupying a large percentage of American plants.

Timely papers have been written with the object of fitting the metal finisher to best do his job with the armament program. Discussions of new developments in the protection of metals through plating, oxide coatings, and painting, and their use on army and navy equipment, occupy many of the papers. No other city can offer as much as Grand Rapids in the realm of furniture. Convention delegates have in store for them a trip through the Imperial Furniture Co., largest manufacturer of tables in this country.

Grand Rapids is inaugurating the "First Annual Photographic Display" of the society at this convention. There will be hundreds of photos of all kinds including equipment, plated parts, people in activities and occupations, still life and animals. A feature of the display will be photos of former conventions including Bridgeport, Cleveland, New York, Milwaukee, Asbury Park, Dayton, and Boston.

Something different for the men will be a Victory Luncheon on the

View of Monroe Avenue looking toward Convention Headquarters

●

second day with the well-known A. P. Haake, economist, as speaker and conductor of the "round table." That the convention is not all on the serious side is evidenced by the entertainment planned to supplement the technical sessions. Social events include the International Fellowship Club Party and the regular Banquet with dinner, dancing, prize drawing, and floor show—the latter comprising outstanding talent of the Middle West.

An extremely interesting program has been arranged by the Ladies' Committee. Luncheons at Herpolshiemer's Tea Room and at the Women's City Club are scheduled—of these, one is Aunt Ella's Party. Tours of the city's points of interest including lakes, gardens, museums, art gallery, and furniture show rooms, are sure to hold interest and will long be remembered. A special treat is planned for the last day with luncheon at Knollcrest Farm. Of course, the ladies attend the International Fellowship Party and the Banquet.

Grand Rapids, known as "The Gateway to the Playground of a Nation" and "The Furniture Capitol of America" is well prepared for the A. E. S. 30th Annual Convention. The city affords the fullest advantages in transportation, hotel accommodations, amusements, recreation, and culture.

The 1942 Convention City is situated on the dividing line of population east and west of the United States, within an overnight's ride of 60,000,000 persons. Five railroads enter Grand Rapids from 12 different direc-

●

A view of the famous Furniture Museum, Grand Rapids, Mich.

**This illustration shows a view of the Grand Rapids New Civic Auditorium. Many outstanding events in the interest of the community are held here.**

tions. The airport has the highest rating in the country for cities its size, and leads the whole country in its safety record. Twice daily round-trip service is offered in giant ships between most of the surrounding cities. Fine arterial highways wend their way to your Convention Headquarters with Greyhound Service between all points.

Being a major convention city, Grand Rapids has unusually fine hotel facilities. The Pantlind Hotel, the Convention Headquarters, has 750 rooms while the Morton and Rowe Hotels are nearby with 400 and 300 rooms respectively. In addition, there are many smaller hotels.

There are no less than eleven excellent Golf Courses. The Blythefield course, which has unusual advantages, has been selected for the A. E. S. golf enthusiasts. Another course, the Cascade Country Club, is also recommended.

The City of Grand Rapids owns the beautiful new Civic Auditorium which is considered one of the finest in the country. It is completely air conditioned, has a main auditorium seating 5,000 persons and a smaller one seating 1,000 people. The building contains 44,000 square feet of exhibition space. The Civic Auditorium is within view of Convention Headquarters.

Also nearby are a number of beautiful, air conditioned theaters showing the latest programs. The fine new Public Museum has just opened a Hall of Ores, Rocks, and Minerals. Among the many interesting features are a Hall of Indian Lore and Indian Relics. Many other points of interest can be visited including Reeds Lake with its adjoining amusement park. The Ladies attending the Convention will visit the Furniture Museum, the Art Gallery, and two large furniture show rooms—the latter unequaled by any in the country.

# How to WASH your products FASTER...

**THIS** Alvey-Ferguson rotary, drum-type, gas heated wash and dry unit was designed especially to speed-wash and speed-dry miscellaneous ball-bearing parts economically—without the use of baskets.

It will also speed-wash and speed-dry cartridge links, clips, rifle parts or instrument parts and many other products for war—or the peace to follow.

If you have a metal parts washing, drying or soaping problem now, or during conversion of your plant, write, without obligation, for new folder on cleaning metal war products today!

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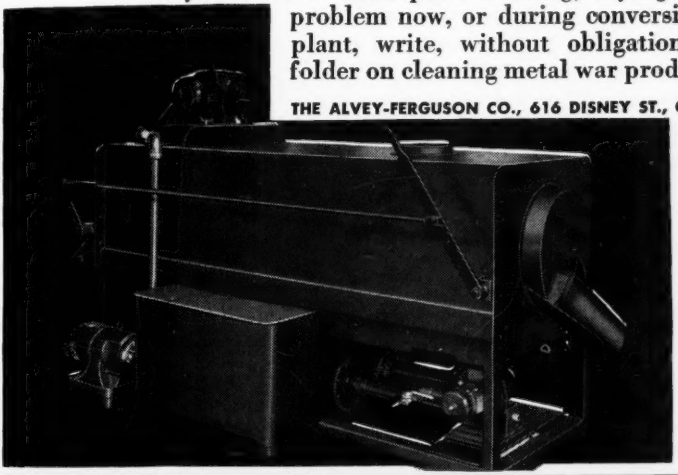

CONVEYING A=F MACHINERY

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*Washing Machines*
**FOR INDUSTRY**

# Official Program of A.E.S. 30th National Convention

**SUNDAY, JUNE 7th**

3:00 P. M. Registration—Mezzanine Floor, Pantlind Hotel.

**MONDAY, JUNE 8th**

8:00 A. M. Registration—Mezzanine Floor, Pantlind Hotel.

9:00 A. M. Welcome to delegates by General Chairman, President of the Grand Rapids Branch, and President E. T. Candee.

10:00 A. M. Educational—Special Victory Session, Maurice R. Caldwell, Presiding.

2:00 P. M. Educational—Technical Session on Plating, Clarence C. Helmle, Presiding.

8:30 P. M. International Fellowship Club—Open House.

**TUESDAY, JUNE 9th**

8:45 A. M. Educational — Organic Finishing, Richard B. Saltonstall, Presiding.

12:30 P. M. Victory Luncheon—Speaker, Dr. Alfred P. Haake—Round Table.

3:00 P. M. Visitation of Imperial Furniture Factory.

8:00 P. M. Educational—Electroplating Session, Clyde Kelly, Presiding.

**WEDNESDAY, JUNE 10th**

8:45 A. M. Educational—Oxide Coatings—Aircraft, Thomas F. Slattery, Presiding.

2:00 P. M. Election of Officers, Reports, Selection of 1943 Convention City.

7:00 P. M. Banquet and Dinner Dance—Floor Show, Drawing of Prizes.

# TO WIN THE WAR

**Our present task is to help win the war.** To that end, our 120 years of experience, and the nation's largest facilities for the production of electroplating equipment and supplies, are devoted to war effort. Our plants are operating to capacity, we have built additions and have increased production wherever possible.

There is no set pattern for the solution of today's metal finishing problems —whether caused by a shortage of raw materials, over-worked equipment, change-overs to meet war demands, or other unusual situations. However, through four wars, many depressions, many booms — H-VW-M has learned how to rapidly meet new and changing business conditions—how to establish and carry out the fairest customer policies to best meet existing emergencies.

Active and progressive research, development, manufacture and service have made H-VW-M the "Plating and Finishing Headquarters"—the leaders in new developments of equipment and methods—since 1820. Today, under war conditions, all this has been stepped up to a new tempo—and when the war is won it will be reflected in peace time facilities far beyond our past service to the plating industry.

*Visit the H-VW-M Headquarters Room at the 30th National Convention of the American Electroplaters Society, Grand Rapids, June 8-10, 1942.*

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# Educational Program

Maurice R. Caldwell, Presiding

## SPECIAL EDUCATIONAL SESSION

Monday Morning—June 8, 1942—9:00 A. M.

### "THE PRESENT SITUATION IN THE ELECTROPLATING INDUSTRY AS REGARDS GOVERNMENT RESTRICTIONS AND GOVERNMENT BUSINESS"

WM. McCORD, War Production Board, Washington, D. C.

This paper discusses the Government restrictions on plating in effect at the time of the Convention, and gives as clear a picture as possible in regard to what the plater can do and cannot do at that time.

Mr. McCord will give his estimate of what the future holds for the plater and cover in general terms, the business which can be expected from the Government.

New applications for electroplating are being developed continually, and the electroplater will be informed of these as accurately as possible in this paper.

### "MILITARY APPLICATIONS OF ELECTROPLATING"

WM. BLUM, U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

The outline of this paper shows that the author is covering the applications for electroplating thoroughly for Military uses.

The discussion covers electroplating used in connection with the manufacturing of the following material—Guns, Ammunition, Tanks, Engines, Zinc plating (spray or brush) on welded joints of galvanized steel tanks, Chromium or nickel plating on marine propellors, Chromium plating cylinder liners of Diesel Engines (van der Horst), Search lights, Radio, Canteens (silver plated inside), Surgical instruments, Plumbing fixtures.

### "CONSERVATION PROGRAM OF THE WAR PRODUCTION BOARD'

HARVEY A. ANDERSON, Chief, Conservation and Substitution Branch Bureau of Industrial Conservation, War Production Board, Washington, D. C.

Mr. Anderson will describe the organization of the Bureau of Industrial Conservation in connection with its simplification, specification, salvage, and conservation and substitution activities.

He will also include a discussion of the critical materials situation, indicating those which are inadequate for the war program and others which are available in various amounts for civilian use. Reference will be made to the effect upon plating activities and the means which are being taken to afford some measure of relief to the distressed plating industry.

He will indicate steps which are being taken to make available increased quantities of silver for war, industrial and arts uses, and studies which are being conducted to demonstrate the suitability of direct silver plating on steel for many applications where copper, nickel, chromium plating has been used heretofore. Reference will also be made to the studies and progress looking toward the utilization of plating equipment to effect savings in metal consumption.

## TECHNICAL SESSION ON PLATING

Monday Afternoon—June 8, 1942—1:45 P. M.

Clarence C. Helmle, Presiding

### "EFFECTS OF SURFACE FINISH ON THE PROTECTIVE VALUE OF ELECTRO-PLATED COATINGS ON STEEL"

G. A. LUX, A. E. S. Research Associate, National Bureau of Standards, Washington, D. C.

This progress report summarizes the work done since June, 1941, on the co-operative investigation of the American Electroplaters' Society and the National Bureau of Standards on the effects upon the protective value of electroplated coatings caused by variations in the degree or method of polishing the base metal. This report is confined to data on cold rolled steel specimens. The methods of preparation (cleaning and pickling), plating, and buffing, and the results, to April, 1942, of outdoor and accelerated corrosion tests are described. Data on the polishing of supplemental steel specimens are also included.

### "COMPARISON OF THE EFFECT OF VARIOUS COPPER DEPOSITS ON CARBURIZATION"

M. M. THOMPSON, Plating Laboratory, National Cash Register Company, Dayton, Ohio

Five copper baths, each of which has had more or less extensive use commercially, were selected with the purpose in mind of trying to establish a relationship between the brightness of a copper deposit (as associated with the density) and the ability of such deposits to withstand carburization. Electrodeposits ranging from .0001" to .001" have been checked together with some coatings of other types, e.g. oxide and alloy coatings. Carburizing times have been varied from 2 to 22 hours. Dropping test methods for thickness were checked in conjunction with the preparation of samples.

### "PREPARATION OF SURFACES FOR HARD CHROMIUM PLATING"

A. W. LOGOZZO, Plastics Department, General Electric Company, Pittsfield, Massachusetts

This paper features X-ray slides on effects of proper and improper heat treating prior to plating and its effects after plating. Pickling and physical preparation, such as grit-blasting, grinding, lapping and buffing, with slides of these various characteristics in the different stages. Featured also, will be treatments to minimize hydrogen embrittlement along the cleaning cycle.

## "ANODE AND CATHODE PHENOMENA" SHOWN BY COLOR PHOTOGRAPHY

F. K. SAVAGE, Research Chemical Engineer, C. G. Conn, Ltd., Elkhart, Indiana

This paper will consist of a series of studies on acid copper, acid zinc, cyanide copper and nickel solutions wherein the appearance of a highly magnified section of the electrodes will be shown in colored film. The effect of varying operating conditions such as current density, temperature and bath concentration will be shown.

## "PASSIVITY"

MAJOR F. A. ROHRMAN, 6th Corps Area, Chicago, Illinois

This paper presents the theory and actual facts relative to passivity in a new and interesting manner.
Major Rohrman, formerly of Michigan College of Mines at Houghton, Michigan, is well known and is a capable author for technical information.
There are many illustrations to bear out the theories with which we are familiar, which will help you to explain some of the anomalies and vagaries of your own corrosion problems.

# ORGANIC FINISHING SESSION

Richard B. Saltonstall, Presiding

Tuesday Morning—June 9, 1942—8:45 A. M.

## "APPLICATION OF ORGANIC FINISHING MATERIALS"

F. H. EDWARDS, The DeVilbiss Company, Toledo, Ohio

This paper covers the subject thoroughly. The necessity for modern equipment in order to meet present-day paint specifications is shown. Also, the various coating systems are explained, enumerating the factors involved for each method. Various types of spraying equipment are explained—including guns, material containers, air regulators, purifiers, spray booths, air compressors, as well as the factors affecting their selection.

A study of finishing room layouts—control of atmospheric conditions—conveyors—material consistency—air and fluid pressures and spraying technique are given.

## "FORMULATION, APPLICATION, AND AVAILABILITY OF ORGANIC FINISHES"

C. A. LANKAU, Chemist, Egyptian Lacquer Company, New York, N. Y.

The relationship between the availability, formulation, and application will be shown giving the further relationship between these factors and the importance of the final product to the Defense Program. The degree of Priority Rating plays an important role in the formulation.

# Finishes to Meet Your War Production Requirements

MANY of those U. S. Government finishes you need for War Production are now available from Permite.

Our long experience in developing the exclusive varnishes and lacquers for Permite Ready-Mixed Aluminum Paints, and the facilities of our new plant, are now at your service to supply —

U. S. Army and Navy Specification clear and colored ammunition lacquers, camouflage paints, zinc chromate primers, olive drab enamels, rust inhibitors, mixing varnishes, etc.

Permite Heat-Resisting Ready-Mixed Aluminum Paint (a type of aluminum paint for which there is no adequate substitute). This paint is available only on WPB allocation.

You can count on the same technical skill and close laboratory control, that always assured the quality of Permite Ready-Mixed Aluminum Paints, to help solve your War Production finishing problems.

Submit your specifications and requirements for complete information and recommendations.

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**When restrictions on virgin aluminum pigment are lifted, our new and thoroughly up-to-date plant will provide modern facilities for resuming the production of Permite Ready-Mixed Aluminum Paints, including any new developments which continued research may have created.**

**PERMITE** *Industrial* **FINISHES**

New applications for organic finishes as substituted for plated finishes or as used to protect plated ware will be discussed. The value of substitutes will also be discussed showing why many are inferior and some are found to be superior to the material being replaced. New methods of finishing as substitutes or replacements for long established finishes, such as metallics, hammered, or other novelty finishes, etc., will be pointed out.

## "MILITARY APPLICATIONS FOR ORGANIC COATINGS"

P. H. GOODELL, Manager, C. M. Hall Lamp Company, Detroit, Michigan

I. Introduction: A. Types of finishes suited to Radiant Heating. B. The heating process (Compared with convection). C. Temperature phenomenon: Energy concentration, ability to absorb, how measured. D. Straight thermodynamic matter. E. Importance of convection with radiation.

II. Finishing War Materials under Radiant Heat: This covers: Primers, Camouflage, Ammunition coatings, Top coats, Zinc chromates, Lacquers, Motor finishes; also includes Slides of installations and Oven design.

## "APPLICATIONS OF PHOSPHATE RUST-PROOFING IN DEFENSE INDUSTRIES"

V. M. DARSEY, Technical Director, Parker Rust-Proof Company, Detroit, Michigan

The conservation of critical materials becomes increasingly important as the Armament program reaches volume production. Phosphating followed by an oil or paint, has proved a suitable finish for protection against corrosion on many articles, thus making available for other uses strategic metals formerly used for this purpose in the Metal Finishing Industry. These applications are covered in the following order:

I. Parkerizing: Type of treatment, Method of protecting base metal, Applied on rifles, gun mounts, ammunition, belt links, bayonets, etc.

II. Bonderizing: Treatment, advantage and application, thoroughly explained.

III. Parko-Lubrizing: Used for reducing friction and resultant wear on moving parts.

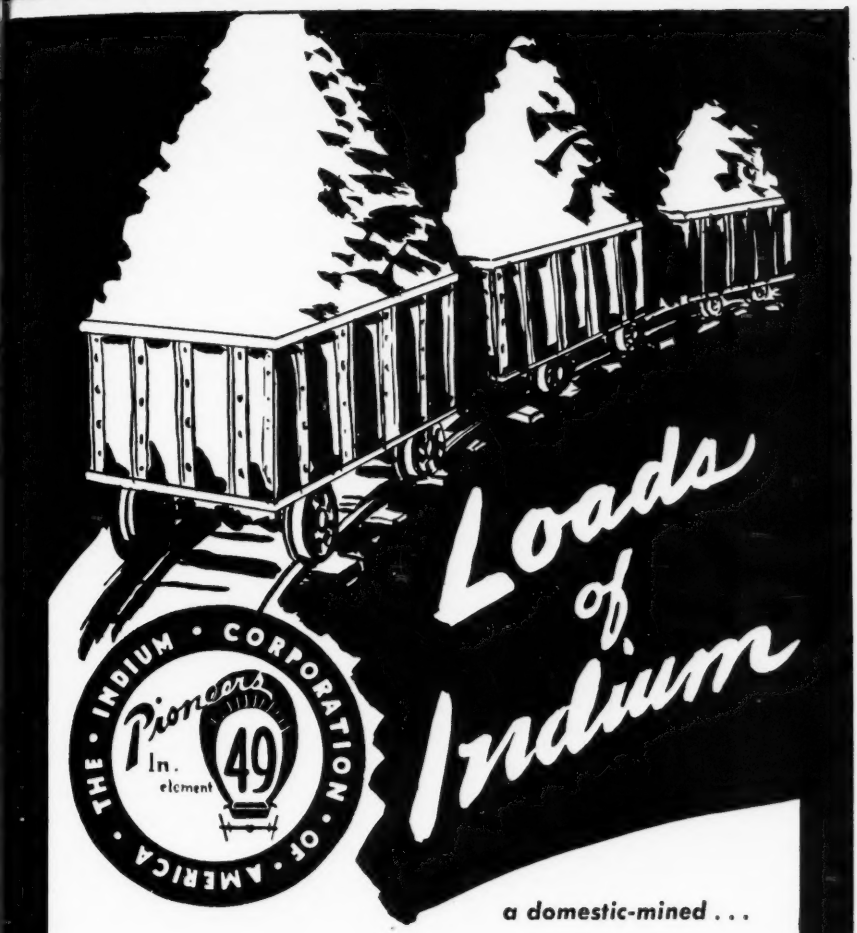
IV. Steelbound: An alternate for galvanizing, Electrodeposition of zinc followed by Bonderizing, Method of saving zinc and tin. Other advantages given.

## "ELECTRODEPOSITING PAINT SPRAY"

HAROLD RANSBURG, Harper J. Ransburg Company, Indianapolis, Indiana

The general principles involved in the use of causing paint spray to be electrically attracted to various articles are given. Also, such operating factors as type of current, construction of electrodes, paint solvent adjustments are given particular attention along with the results obtained and their value to production.

A unique application for electricity is utilized, whereby a high potential field eliminates "fatty edges" and "tear drips" from dipped pieces.

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*commercially priced metal . . . immediately available . . .*

## *ASSURES CONTINUED PRODUCTION*

**INDIUM can replace many critical metals for both functional surfaces and decorative finishes. INDIUM resists wear and corrosion, inhibits fatigue, retards tarnish, and increases tensile strength. INDIUM can provide a bright, lustrous, permanent finish that will not chip or peel.**

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## EDUCATIONAL SESSION—ELECTROPLATING

Clyde Kelly, Presiding

Tuesday Evening—June 9, 1942—8:00 P. M.

### "SUBSTITUTION OF IRON FOR NICKEL AND COPPER IN PRINTING PLATES"

VERNON A. LAMB and W. BLUM, Chemists, National Bureau of Standards, Washington, D. C.

Under normal conditions the printing industry consumes monthly about 10,000 pounds of nickel and 350,000 pounds of copper in the manufacture of printing plates. The present shortage of these metals makes it imperative to reduce such uses.

Experiments made in co-operation with the National Bureau of Standards and the Government Printing Office indicate that all of the nickel and at least one-third of the copper may be replaced by deposits of iron. This metal may be plated from sulfate baths onto stereotypes and copper electrodes. For making true iron electrotypes on wax and lead molds, a bath containing ferrous chlorides and potassium chloride is most satisfactory. Operating conditions for these baths are described.

### "INDIUM PLATING IN PRACTICE"

WM. S. MURRAY, President, The Indium Corporation of America, Utica, N. Y.

The history of the element "INDIUM" is in many respects similar to that of other elements.

1. Short history of its discovery and production.
2. A list of the physical and chemical properties.
3. Sources and production.
4. The known uses for Indium, its alloys and compounds.
5. A description, together with lantern slide pictures of a typical Indium plating process: (a) Preparation of steel surfaces to be plated. (b) Preparation of steel bonderized surfaces preparatory to silver plating. (c) Methods of recovery of silver from waste water. (d) Preparation of silver surfaces for Indium plating. (e) Complete description of Indium plating bath and uses. (f) A description of processes of recovering Indium from rinse water. (g) Full description of diffusion of Indium into silver plate. (h) Final finishing of Indium diffused coating.
6. Process for stripping defective work of Indium and silver.

### "COMPARATIVE TESTS OF OCEAN WATER SPRAY vs. STANDARD SALT SPRAY"

C. E. HEUSSNER, Engineering Division, Chrysler Corporation, Detroit, Michigan

Corrosion data is given—comparing the life of electro deposited specimens in the salt spray and under weather conditions. This covers testing in controlled salt spray boxes using sea water, 20 per cent salt solution and 3 per cent salt solution as the testing medium.

Tests were conducted at room temperature and at elevated temperatures. The results show definite trends which should be interesting to any electroplater.

Pennsalt Cleaner is helping speed the production of Machine Gun barrels in this plant, with fast, efficient stripping and cleaning.

**Prominent Manufacturer of Tools, Gauges, Machines and Specialty Parts reduces rejects—increases production—cuts costs**

# with PENNSALT CLEANERS

This manufacturer of precision parts—many for guns and aircraft—requires metal cleaners with extraordinarily high standards of performance. The extremely close tolerances to which the parts are held—plus the imperative demand for maximum output made the choice of cleaner an important one.

Pennsalt Cleaners meet the rigid requirements of this plant with notable success. The operations were:—The unusually thorough and uniform removal of oil and buffing compound from steel and zinc necessary before chrome plating . . . the stripping of hard chrome plate from steel, with the positive assurance of no injury to the steel surface . . . and the heavy-duty cleaning of steel prior to cadmium plating.

The illustration above shows machine gun barrels being cleaned. Pennsalt Cleaner is used to clean new barrels before chrome plating and, in reconditioning barrels, to strip chrome from the steel before replating.

In all their exacting duties Pennsalt Cleaners have an outstanding record. Here it is:—*Increased production because of fewer rejects* . . . a reduction in cleaning costs . . . smoother plating surfaces and more efficient stripping, through better conductivity.

A test in your plant under your own conditions will show you why Pennsalt Cleaners have won the confidence and endorsement of so many manufacturers in a wide range of metal cleaning operations. An experienced technical staff is at your service for information or advice, without obligation. Or write fully to our Pennsalt Cleaner Division, Dept. P.

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*Chemicals*

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## "THE SULFAMATE LEAD PLATING PROCESS"

E. W. SCHWEIKHER, Electroplating Division E. I. Du Pont De Nemours & Company, Inc., Cleveland, Ohio

A new lead plating process has been developed based upon the sulfamate solution, together with addition agents which contribute to the deposition of good quality lead deposits with unusually good covering power.

In marked contrast to the fluoborate and fluosilicate baths, both of which are prepared from somewhat corrosive and dangerous hydrofluoric acid, the lead sulfamate bath is made up by the simple addition of dry salts to water.

The bath operating characteristics include the deposition of smooth lead deposits of almost any thickness desired, 100 per cent anode and cathode efficiencies, high degree of bath stability, application to both still and barrel plating, and simple solution maintenance.

## "BRIGHT COPPER PLATING IN ACID BATHS"

FRANK CLIFTON and W. M. PHILLIPS, Electro-Chemistry Department, General Motors Corporation, Detroit, Michigan

This paper is written with the idea of showing the effect that certain addition agents and classes of addition agents have on the structure of deposits from acid copper baths. This structure is responsible for a condition of deposit which may be readily and inexpensively buffed to a high luster or be so lustrous that no buffing is required.

This bath was put into use last year by a number of companies who secured a license from the General Motors Corporation to use it. The license was given to these manufacturers without payment of royalties in an effort to conserve our national resources in copper, and this arrangement is still available for any necessary form of copper plating where it can be used advantageously. This paper gives some of the experiences of these users and their contributions which further developed the utility of the process.

Photographs of X-ray defractions of the copper deposited by different methods are shown and the effect of agitation is demonstrated as agitation in this bath is advantageous as it is in most baths. The advantages and disadvantages are explained.

## EDUCATIONAL SESSION—OXIDE COATINGS—AIRCRAFT

Thomas F. Slattery, Presiding

Wednesday Morning—June 10, 1942
8:45 A. M.

## "SURFACE TREATMENTS FOR MAGNESIUM"

H. K. DE LONG and WM. H. GROSS, The Dow Chemical Company, Midland, Michigan

Magnesium has been designated as one of the most vital metals of our Defense Program. The increased production which has already taken place within the last year, plus the anticipated increase, is certain to make magnesium alloys as familiar to industry as are other nonferrous metals.

The general technique employed when cleaning, degreasing, pickling, chemical dipping, and electroplating is given.

Army and Navy specifications are reviewed, and also the surface treatments and requirements when applying paint.

## "PREPARATION OF ANODIZED ALUMINUM FOR PLATING"

WM. J. TRAVERS, Krome-Alume, Inc., Buffalo, N. Y.

Various theories have been advanced to account for the remarkable adhesion obtained by the Travers method of electroplating on aluminum. Experimental evidence is advanced to prove there is present in anodized aluminum film a reservoir of oxygen that reacts vigorously with the initially electrodeposited metallic film. Thus, there is superimposed on the original aluminum anodic oxide film, a second oxide film of the electro-deposited metal, which acts as a binder to hold the main deposit of the electroplated metal to the aluminum coating. The second film does not assume its normal metallic aspect until the oxygen present in the anodic film has been depleted.

## "ANODIC TREATMENT OF ALUMINUM BY THE CHROMIC ACID PROCESS"

L. G. TUBBS, Chief Chemist, Mutual Chemical Company of America, New York, N. Y.

The anodic treatment of aluminum by the chromic acid process is of military importance because of its wide application in the treatment of aluminum alloys for aircraft. In the past inefficient operation has resulted because of ignorance of the fundamental principles involved. This report shows how the chromic acid may be used efficiently and a more uniform product obtained. The advantage of operating at a maintained pH, rather than by the customary batch method, is shown. Only two control tests are required: pH and Baume'. Graphs, tables, and directions are included which will be of practical assistance to the commercial anodizer.

Data on the operation of baths at various maintained pH are presented giving the practical film efficiency, weight of anodic film, current density, alumina dissolved, area anodized per pound of chromic acid, and current used per pound of chromic acid, for aluminum alloys 17 ST, 24 ST, and Alclad 24 ST. Data is given showing chromic acid consumption at different bath concentrations and the effect of temperature.

A procedure for operating a maintained bath is described and plant control methods recommended.

## "METAL FINISHING FOR MILITARY AIRCRAFT"

E. R. IRWIN, Chief Chemist, Army Air Force, Wright Field, Dayton Ohio, and J. TERES, 1st Lt., Army Air Force in charge of Corrosion Projects, Wright Field, Dayton, Ohio

The talk will include the following topics:

1. A discussion of anodizing, chromadizing, alcoholic-phosphoric acid dipping and alkaline dichromate-carbonate treating of aluminum alloys.

2. Treatment of magnesium alloys including pickling, chrome pickling, anodizing, galvanic anodizing and dichromate boiling.

3. Cadmium plating and chemical surface treatments of the phosphate and oxide types for steel.

4. A discussion of copper, tin lead, indium and chrome plating as applied to engine design.

# LADIES' PROGRAM for Grand Rapids 30th National A. E. S. Convention

**SUNDAY, JUNE 7th**

3:00 P. M. Registration—Mezzanine Floor, Pantlind Hotel.

**MONDAY, JUNE 8th**

8:00 A. M. Registration.
9:00 A. M. Opening of Convention, Welcome to Delegates by General Chairman, President of the Grand Rapids Branch, and President E. T. Candee.
1:30 P. M. Luncheon and Games Party, Herpolsheimer Tea Room.
8:30 P. M. International Fellowship Club—Open House Dancing, Buffet Supper, Entertainment.

**TUESDAY, JUNE 9th**

9:30 A. M. Tour of Furniture Factory Show Rooms Imperial Furniture Company—Robert W. Irwin Company.
1:00 P. M. Luncheon at Women's City Club, Aunt Ella Society Luncheon.
2:30 P. M. Visitation of Grand Rapids Furniture Museaum—Art Gallery.
8:00 P. M. Convention Hosts to the Ladies, Entertainment, and Distribution of Convention Gifts.

**WEDNESDAY, JUNE 10th**

10:00 A. M. Tour of City and Gardens.
12:30 P. M. Luncheon at Knollcrest Farms.
7:00 P. M. Banquet and Dinner Dance, Floor Show, Drawing of Prizes.

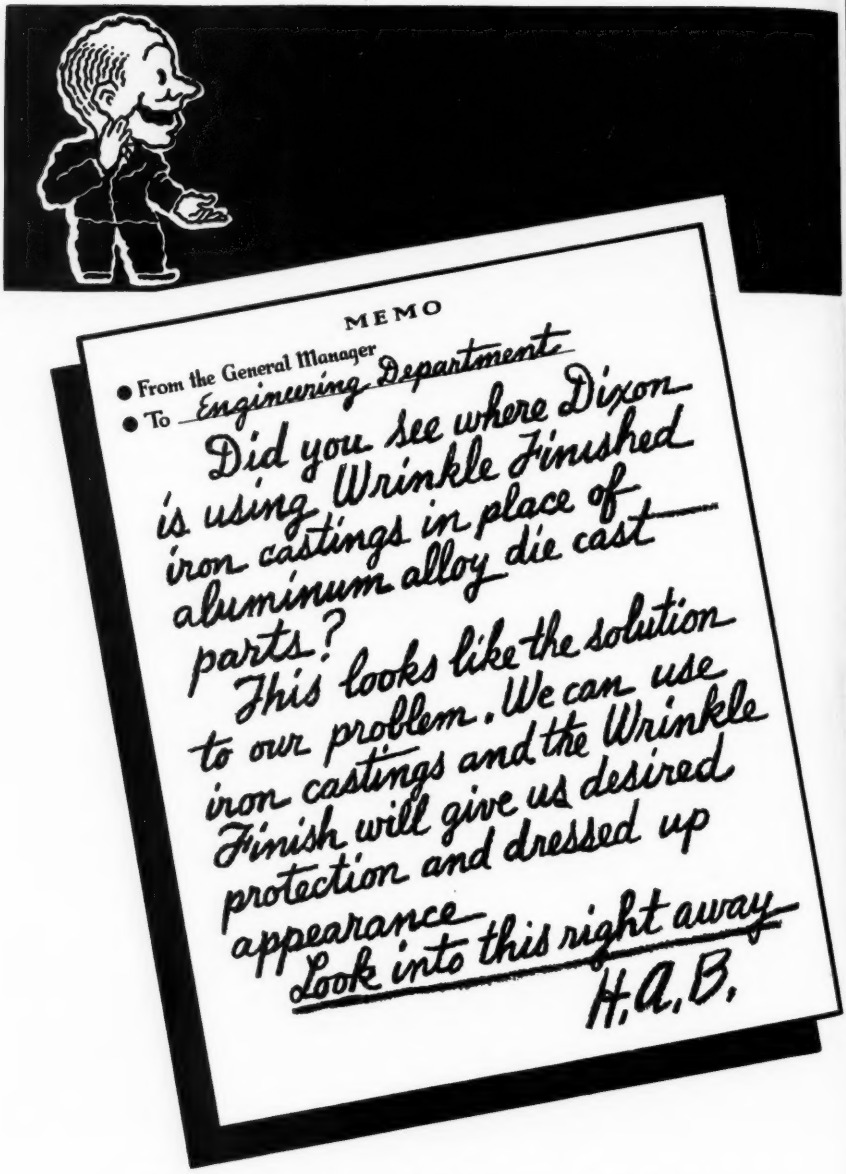
The Grand Rapids Ladies' Committee has been on the job selecting favors, planning luncheons, a tour of the city, and visits to various points of interest. Ladies attending the Convention are sure to be enthusiastic over the diversified program arranged for their comfort and pleasure as well as for their education. To be sure, there will be open dates when they may cater to their own special interests.

To start with, the luncheon on the opening day will be in the Tea Room of the Herpolshiemer Department Store, where there will also be a Games Party. Another luncheon at the Women's City Club, scheduled for the second day, is sponsored by the Aunt Ella Society. Grand Rapids has a unique Furniture Museum which will enthrall the "better half" of the convention. This museum, unlike any other in the country is housed in a fine old mansion. Displaying original masterpieces, the museum contains a collection of period furniture dating back as far as the 16th century. Modern furniture is displayed in what is known as the "House of Today" consisting of a series of beautifully furnished rooms, complete with accessories, arranged by five nationally known decorators.

The Ladies will visit the Art Gallery which will have on display, at that time, a special exhibit of water colors. The Fine Arts Section of the U. S. Treasury Department sponsored a national art contest to find pictures suitable for use in government hospitals. The pictures were, necessarily, to be in the low price brackets. Those to be on display will be the winners of the national contest.

Pleasant diversion is in store for those attending the Tuesday evening

**LADIES' COMMITTEE, GRAND RAPIDS A. E. S. NATIONAL CONVENTION**
*Left to Right Standing:* Mrs. C. M. Fernekes, Mrs. I. C. Hepfer, Mrs. H. G. Morton, Mrs. M. R. Caldwell. *Left to Right Seated:* Mrs. H. C. Castle, Mrs. J. C. Miller, Mrs. C. W. Smith, Mrs. F. D. Pace


MEMO
From the General Manager
To Engineering Department
Did you see where Dixon is using Wrinkle Finished iron castings in place of aluminum alloy die cast parts?
This looks like the solution to our problem. We can use iron castings and the Wrinkle Finish will give us desired protection and dressed up appearance
Look into this right away
H. A. B.

**WRINKLE FINISH IS SERVING DEFENSE TOO!**

**Wherever surface protection at its best is required, Wrinkle Finish is used. The many pieces of war equipment finished in Wrinkle leave no doubt as to this.**

# WRINKLE NOW WIDELY USED FOR FINISHING SUBSTITUTE MATERIALS

**Aluminum and other critical materials are "out" for low priority and non-defense items, hence manufacturers are re-engineering their products to use the more plentiful metals and finishes.**

**Here are actual examples of how some manufacturers have solved war-time manufacturing problems with Wrinkle Finish.**

| FORMERLY USED | NOW USED | |
|---|---|---|
| Stainless Steel | Cast grey iron and Wrinkle Finish | CONTINUED PRODUCT ACCEPTANCE |
| Prime quality roll steel | Stamped auto body steel and Wrinkle Finish | |
| Aluminum die casting | Cast iron and Wrinkle Finish | |
| Nickel and Chrome plated parts | Cold roll steel and Wrinkle Finish | |
| Punched aluminum | Steel Plate and Wrinkle Finish | |
| Cast aluminum housings | Iron pipe fittings and Wrinkle Finish | |
| Chromium finish | Wrinkle Finish | |

**Thanks to Wrinkle Finish, many perplexing problems of substitution are easily and quickly remedied. Now more than ever before the advantages of this one-coat, all concealing, durable finish are apparent. Tell your story to your Wrinkle Finish supplier. His recommendations based on actual experience will be most helpful. Call him in today!**

Write for a copy of "New Wrinkles in Finishing." Contains many helpful suggestions and finishing information.

**NEW WRINKLE INC.**

**314 W. FIRST ST. · · · DAYTON, OHIO**

Knollcrest Farm and home of J. C. Miller—one of the beautiful places to be visited by the ladies who attend the 30th Annual American Electroplaters' Convention

party. Mrs. J. C. Miller, head of the Ladies' Committee, has arranged the entertainment and will distribute the gifts. One morning will be taken up with a tour of two of the large furniture factory showrooms. The Robert W. Irwin Co. and the Imperial Furniture Co. have showrooms displaying the largest collections of finest modern furniture in the world.

Of these showrooms, that of the Robert W. Irwin Company is outstanding. This showroom occupies a huge floor space, and represents the largest collection of fine furniture of current manufacture in the world. The Robert Irwin Company, established in 1890, is considered one of America's leading makers of fine furniture. Irwin Furniture will be found in the White House, Exeter Academy, Warner Brothers motion pictures, and many fine hotels, and has been on exhibition in model homes from coast to coast, including those at the Chicago and New York World Fairs.

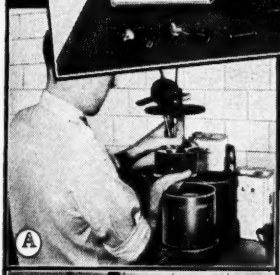
A sightseeing tour will take the Ladies to beauty spots and interesting sections of the city. The trip will terminate at the Knollcrest Farm, home of J. C. Miller, where luncheon will be served before the ladies return to Convention Headquarters. Of course, the Ladies will attend the International Fellowship Club Party and the Banquet. Everything has been done to make these functions outstanding and not soon to be forgotten affairs.

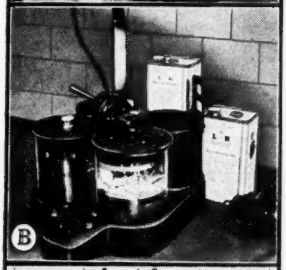
A view showing one corner in the extensive showrooms of Robert W. Irwin Furniture Company

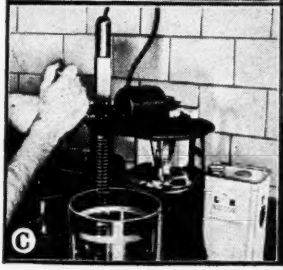
# CLEANS RINSES DRIES

INSTRUMENTS, METERS, GAUGES, BEARINGS, PRECISION UNITS OF ALL TYPES, PARTS THAT REQUIRE FAST, PERFECT CUSTOM CLEANING — IN CONTINUOUS OPERATION

## L&R INDUSTRIAL CLEANING MACHINES & SOLUTIONS




*USED BY AIR CORPS, NAVY, MAJOR AIR LINES, UTILITIES, INSTRUMENT MANUFACTURERS AND USERS, PRODUCERS OF JEWELS AND BEARINGS, MUNICIPALITIES, AND INDUSTRIES REQUIRING AN EXTRAORDINARY, INEXPENSIVE CLEANING PROCESS.*

To operate: Parts placed in work basket (A) (volume capacity 5½" ID x 3⅜" deep) are agitated in first jar (B) containing L & R POWER NOFOME CLEANER, in second jar containing L & R RINSING SOLUTION, in third jar containing L & R RINSING SOLUTION and then are dried in self contained heater chamber (C). Parts are cleaned and dried thoroughly of grease, grime and discoloration in continuous operation, without causing rust, corrosion or removal of metal. Perfect, uniform results, amazing savings in man hours. Almost 15,000 L & R Machines already in use.

**FREE:** *Illustrated booklet — demonstration. Write, outlining cleaning problems. Let L & R engineers and chemists solve them, without obligation.*

L & R MANUFACTURING COMPANY
54 CLINTON STREET, NEWARK, NEW JERSEY

# A.E.S. Convention Events

## PHOTOGRAPHIC DISPLAY

The branch displays of plated ware which have been featured during the past conventions will not be held during the Grand Rapids Convention. It would be difficult indeed this year to attempt to assemble plated products for display. With practically all of the metals formerly used for decorative purpose on the list of strategic materials for war purposes, very few of them will find their way onto non-defense items. The war effort requires the plating of many parts for both the Army and the Navy, but such parts are not usually put on public display and it is difficult to get permission to do so.

Therefore, the 1942 convention committee decided to put on a photographic display. Such a display has many interesting features. Many platers being chemists are interested in amateur photography and this will be a chance for them to show their hobby in competition with other platers. It is expected that there will be many interesting and highly artistic photos shown in this category.

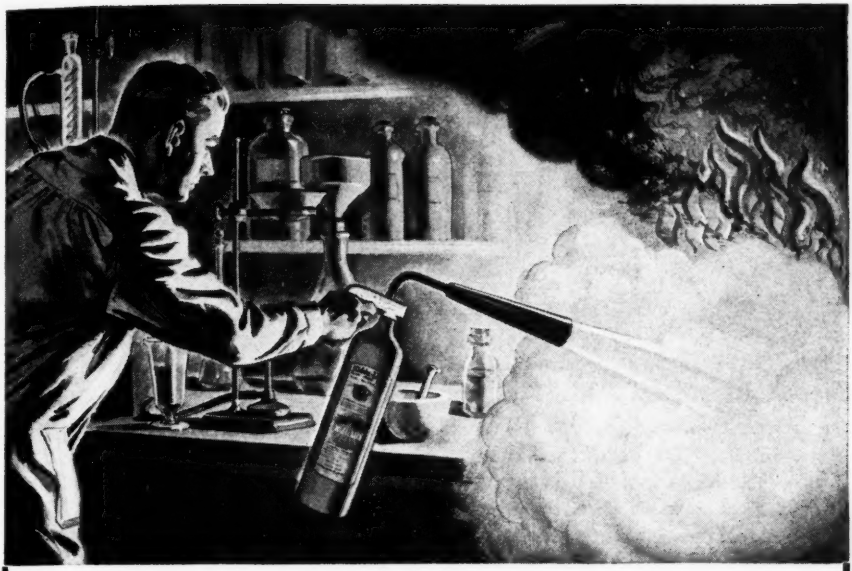
All firms engaged in the manufacture and selling of plating and polishing equipment have in their possession pictures of their machines and of installations of these machines. Pictures of this type are always of interest to those engaged in plating. This part of the photographic display can, to some extent, take the place of the manufacturers' exhibits held at some of the past conventions and will not doubt attract a great deal of interest.

Prize ribbons will be given in the various classes according to rules set forth. There will be three judges selected to award the ribbons, consisting of two prominent men in the society and one Grand Rapids photographic artist, assuring fair and impartial judging. All members and manufacturers are urged to contribute to this new and different feature.

## AUNT ELLA SOCIETY

Aunt Ella Society stands for the genial character who is in reality Oakite Products, Inc., and Dave Clarin, her progenitor. It can readily be seen that A E S are the initials for Aunt Ella Society, as well as the American Electroplaters' Society. The program in the past two years for the ladies who attend the convention has been one of the high spots.

Oakite Products, Inc., have generously extended Aunt Ella to cover the Ladies' Luncheon on Tuesday at the Grand Rapids Convention. This will be held at the Women's City Club on the day of the visitations to the furniture factory showrooms. It will be a pleasant sojourn, not to be forgotten, and Aunt Ella has seen to it that the ladies will be entertained as well.



# PULL THE TRIGGER *KILL THE FIRE!*

Here it is! . . . the fastest-action, easiest-to-operate fire-killer you ever saw!

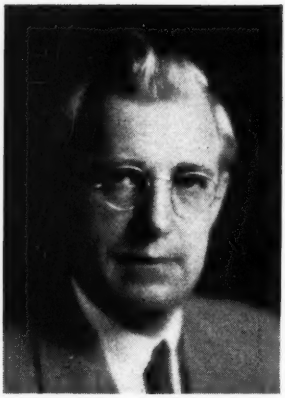
There's a pistol grip for one-handed action and for quick maneuverability. There's a trigger-control for fast, easy discharge. Only the Kidde has these sensible, simple features.

You can get Kidde trigger-control extinguishers with 2 or 4 lbs. of carbon dioxide capacity. Use them against flammable liquid or electrical fires. Hang Kidde units in laboratories and garages, near work benches and on your trucks. When fire strikes, Kidde snuffs it out fast in a flurry of carbon dioxide snow-and-gas. Just *aim . . . shoot . . . kill the blaze!*

Think this over: Newly-hired workers may not know how to handle some industrial-type extinguishers in a sudden emergency. *But anyone knows how to pull a trigger!*

K Kidde
SNUFFS OUT FIRE

**Walter Kidde & Company**
Incorporated
**631 West Street** **Bloomfield, N. J.**



Dr. Alfred P. Haake

## A. E. S. VICTORY LUNCHEON

Previous conventions have provided an educational program designed to be primarily of interest to the plater and the plating chemist and have always been well attended by those who are executives in the plating industry. These man, who are platers or chemists in the strictest sense, make up nearly half of the attendance at the National Convention and it is fitting that their interests should be considered. It is with this idea in mind that the VICTORY LUNCHEON has been scheduled for Tuesday, June 9th, 12:30 P. M., at the Pantlind Hotel. The Frederick Gumm Chemical Co., which has consented to sponsor this VICTORY LUNCHEON, has sponsored luncheons at past conventions.

The 30th National A.E.S. Convention Committee presents, DR. ALFRED P. HAAKE, Managing Director of the National Association of Furniture Manufacturers, Inc., who has chosen as the title of his talk, "WE MUST WIN THE WAR, BUT HOW?"

DR. ALFRED P. HAAKE is a graduate of the University of Wisconsin, where he was recipient of graduate scholarships in the fields of Literature, Journalism and Economics. He also received his degree as Doctor of Philosophy at the University of Wisconsin.

During the World War I, he taught "Company Administration" and "Quartermaster and Ordnance Service."

In 1928, he established the National Association of Furniture Manufactures and became the Managing Director—a position which he still holds. To these activities he is now giving a part of his time in a supervisory capacity, while he has taken on the post of Chief Economist for the American Economic Foundation. He appears regularly as a discussion leader on the "Wake Up America" radio program.

Cascade Country Club, Grand Rapids, Michigan

## AVAILABLE FOR IMMEDIATE SHIPMENTS

# PLATING SUPPLIES

Government restrictions and limitations result in certain overstocks of plating supplies that we offer for immediate sale as listed below.

**PRICES ARE ALL F.O.B. CARS, OUR LOADING PLATFORM, CHICAGO, ILL.**

| ITEMS | On Hand | Price |
|---|---|---|
| Cadmium Chloride (240 lb. Bbls.) | 1,200 Lbs. | $91.00 Per Cwt. |
| Magnesium Chloride (400 lb. Drums) | 1,200 Lbs. | 2.20 Per Cwt. |
| Specialime (#100 Comp.) (350 lb. Bbls.) (Hanson, Van Winkle, Munning Co.) | 4 Bbls. | 8.55 Per Cwt. |
| Borolon Pol. Grain.-120-CT. (375 lb. Drums) | 17,100 Lbs. | 9.75 Per Cwt. |
| Chromic Acid (Flake) (400 lb. Drums) (E. I. DuPont DeNemours & Co.) | 30,000 Lbs. | 16.25 Per Cwt. |

### NICKEL PLATING CHEMICALS, ETC.

| | | |
|---|---|---|
| #1-E Nickel Brightener (Udylite Corp.) | 12 Gals. | $ 3.00 Per Gal. |
| #2 Non-Pitter (Udylite Corp.) | 12 Gals. | 2.50 Per Gal. |
| #3-SP Nickel Brightener (Udylite Corp.) | 10 Lbs. | 4.00 Per Lb. |
| Potassium Permanganate (Udylite Corp.) | 5 Lbs. | .60 Per Lb. |
| XXX Solution-D (Harshaw Chemical Co.) | 12 Gals. | 2.00 Per Gal. |
| XXX Solution-20 (Harshaw Chemical Co.) | 12 Gals. | 3.50 Per Gal. |
| XXX Solution-44 (Harshaw Chemical Co.) | 30 Gals. | 5.00 Per Gal. |
| Nickel Chloride (275 lb. Bbls.) | 14,950 Lbs. | .18 Per Lb. |
| Cobalt Sulphate (550 lb. Bbls.) | 11,445 Lbs. | .80 Per Lb. |
| Nickel Salts-Crystal (425 lb. Bbls.) | 361 Bbls. | .13½ Per Lb. |
| Nickel Carbonate (Catalytic) | 250 Lbs. | .40 Per Lb. |
| Special Nickel Carbonate (225 lb. Bbls.) | 15,975 Lbs. | .36 Per Lb. |

This material is offered subject to all Government regulations applying to its sale. Items are offered subject to prior sale.

**Write, Call or Wire Purchasing Dept., Berkshire 6000**

## EDWARD KATZINGER COMPANY

**1949 North Cicero Avenue • Chicago, Illinois**

## FELLOWSHIP CLUB PROGRAM

Reports received from the Grand Rapids Branch indicate that the 1942 convention should be as successful as normal conventions held in the past. The International Fellowship Club will continue to co-operate as in the past. The tentative program as arranged is as follows:

ANNUAL LUNCHEON—Monday, June 8th—Swiss Room.

Since the hotel management must have definite information as to the number who will attend, and inasmuch as the Club will have a discussion on Open House and other matters presented at the annual meeting, it has been decided that this year the meeting will be exclusively for the manufacturers and representatives of equipment and supply houses catering to the plating and finishing industry. The order of business will be:

Lunch, election of officers and discussion of arrangements for OPEN HOUSE.

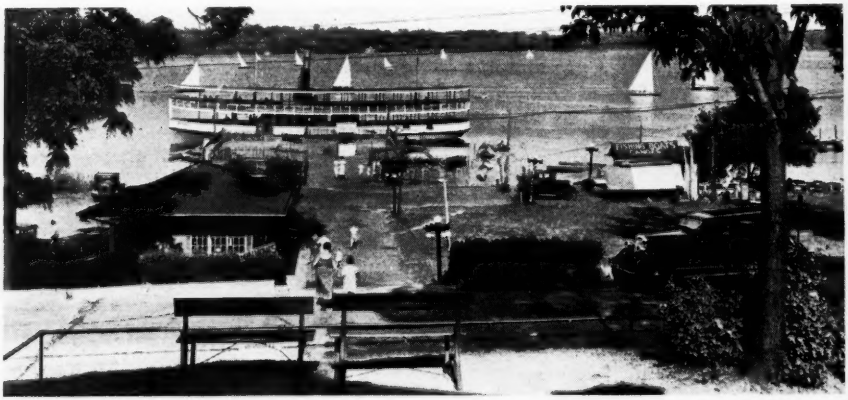
OPEN HOUSE—MONDAY EVENING, JUNE 8th.

8:30—Grand Opening. Dancing and refreshments.

10:15—A buffet lunch will be served and will be available until closing.

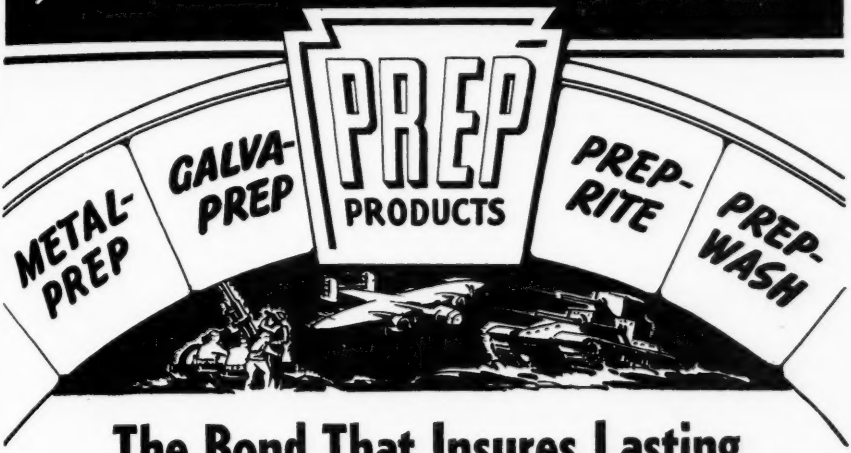
As in the past, it is expected that all those who register will attend the OPEN HOUSE. The purpose of Open House, held on the first night of the convention, is to offer an opportunity for all registrants to become better acquainted and to create better co-operation in the industry.

This feature of the convention is provided by the liberal contributions of firms selling to the plating and finishing industry. These firms and their representatives invite every registrant to attend. A program including a list of contributors will be distributed to registrants.



Reed Lake—A Lake Within a City—Grand Rapids, Michigan

# The KEYSTONE




## The Bond That Insures Lasting Adhesion Between Metal and Paint

PREP products are serviced by experienced men who have had close contact with cleaning and painting problems, varying from the treatment of comparatively few units a day to the high production of several thousand units a day. This service is available to you, and at the same time you may benefit by the safeguards made possible by the Prep product best suited to your requirements.

***"PREP" PRODUCTS USED FIRST . . . MAKE THE PAINT FINISH LAST***

***Write for Literature***

**NEILSON CHEMICAL COMPANY**

Windsor, Ont. Canada — **6564 Benson St., Detroit, Michigan** — Los Angeles Calif.

# CONVENTION CO

Charles O. Werft

TO THE MEN from the Grand Rapids Chapter of the American Electroplaters' Society who greet you from these pages fell the responsibility of planning a National Convention during one of the most strenuous intervals in the history of our Nation. As chairmen of their respective committees, these men have had the will and the determination to execute well thought out plans which will make the 30th Annual Convention of the Society outstanding in every respect.

Stewart Martin

Even after it was decided to reduce the time allotted for Convention activities to three days, these men skillfully readjusted the original program to include the educational, recreational, and entertainment features which would be of the greatest benefit to the majority of the members of the society who make the sojourn to Grand Rapids during the week of June 8.

Chester W. Smith

To these men, also, should be given the credit for the monumental task of arranging for the

Fremont D. Pace

Ivan C. Hepfer

Homer G. Morton

# COMMITTEE

photographic display, plant visitations, and banquet, and all of the other details which are involved in the management of a National Convention.

**Registration . . .**
Charles O. Werft

**Entertainment Committee . . .**
Stewart Z. Martin

**Program and Publicity . . .**
Fremont D. Pace

**Plant Visitation . . .**
Ivan C. Hepfer

**Financial Secretary . . .**
Homer G. Morton

**General Chairman . . .**
Chester W. Smith

**Exhibits and Recreation . . .**
Jack J. Hanney

**Advisory . . .**
Maurice R. Caldwell

**Transportation . . .**
C. E. Abel

**Hotel Reservations . . .**
Clyde Craven

**Educational Chairman . . .**
Lyman B. Sperry

Clyde Craven

C. E. Abel

Jack J. Hanney

Maurice R. Caldwell

Lyman B. Sperry

# *National Officers American Electroplaters' Society*

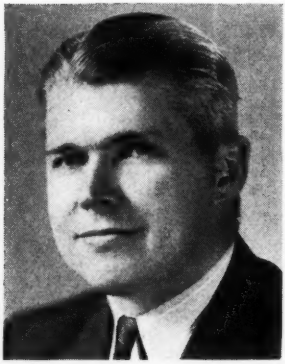
CHARLES C. CONLEY
First Vice-President

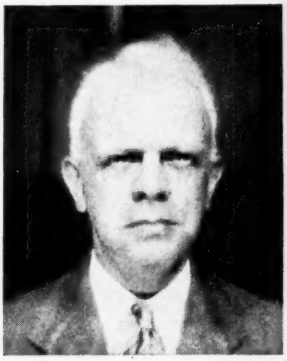
GEORGE WAGNER
Second Vice-President

ELLSWORTH CANDEE
President

MAURICE R. CALDWELL
Third Vice-President

W. J. R. KENNEDY
Executive Secretary





# PARTS COME CLEAN

## QUICKLY . . . EASILY . . . COMPLETELY

*. . . with*

## SUN SPIRITS

Just a few dips . . . and Sun Spirits penetrates the minute pores of the metal . . . cuts oil, grease and dirt. Parts come out sparkling clean, ready for the next operation. Sun Spirits makes metal cleaning quick . . . easy . . . efficient—requires no mixing, no elaborate equipment.

If you are faced with a metal cleaning problem or the need for substituting for more expensive, "hard-to-get" solvents, try Sun Spirits. You'll find they can be used to replace many other solvents now almost impossible to obtain. Call in a Sun Oil Engineer—one of those Doctors of Industry—let him show you how you can save and conserve with Sun Spirits. And for factual proof of what proper engineering service has achieved, write for your free copy of "Helping Industry Help America."

**SUN OIL COMPANY • PHILADELPHIA**

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SUN PETROLEUM PRODUCTS

HELPING INDUSTRY HELP AMERICA

# *Conservation of Plating Materials*

*This paper was prepared by J. A. Raskin of the Udylite Corporation for the Annual Educational Session, Los Angeles Chapter, American Electroplaters' Society*

TODAY, when we are engaged in a struggle to maintain the democratic ideals of our country and its allies, it becomes a patriotic duty and necessity to operate our industries at maximum efficiency and speed. This problem is made increasingly difficult due to the shortages of almost all materials and supplies normally used in the plating and finishing industry.

In the past we have been wasteful of materials, because labor costs were reduced at a sacrifice of material consumption. The trend to faster production led to higher current densities, with higher power loss from poor conductivity of hot bus bars, from higher anode and cathode polarization, and from lower cathode efficiency.

In most cases, conservation of materials was economically justified but totally neglected. Today we must adjust ourselves and meet the problems as they arise with ingenuity and good common horse sense.

Some suggested methods for conserving plating materials which should prove helpful, are as follows:

**Cleaning**

Cleaners and cleaning methods have long been the bane of platers. There are some self-evident facts that should be followed. Use the concentrations and operating conditions recommended by the vendor, or found best by you, and control the cleaner by the following methods:

(1) Maintain a constant temperature in the cleaner solution. This can be done simply with the use of a thermometer and steam valve, or it can be controlled by temperature regulators. Obviously, if the temperature fluctuates, the conditions for successful cleaning will be in a constant flux, and one more variable will be added to an already complex operation. (2) Control the effective alkalinity by chemical tests and physical observations. Titration of the cleaning bath is a reliable method for checking the amount of alkali present. For example, a titration for active alakli to a phenolphthalein end-point, followed on the same sample to a methyl orange end-point will show bath active and inactive alkali

present. Based upon satisfactory titration values, it is possible to fortify the bath suitably to maintain peak efficiency.

Another determination which is used to supplement the titration values is the determination of pH. It is probable that baths for specific purposes will operate at efficiencies at given pH and and titration values. In other words, bath strength as pH, and quantity as the titration value of the alkali, must be determined.

The recently developed materials used in cleaners may be weaker alkalis, as to caustic strength, than older types, but they are effective detergents because of their complex structure; water softening and lime suppressing qualities. Therefore, the pH titration values may vary for different type cleaners. A standard should be set at the start of a cleaner bath, and kept at that figure.

Another test that can be used in evaluating cleaners, is to determine how much of a given quantity of mineral oil or lanoline will be emulsified by given concentrations of cleaner. Electro-cleaner efficiency should be controlled also by the determination of current consumption to obtain unit cleanliness.

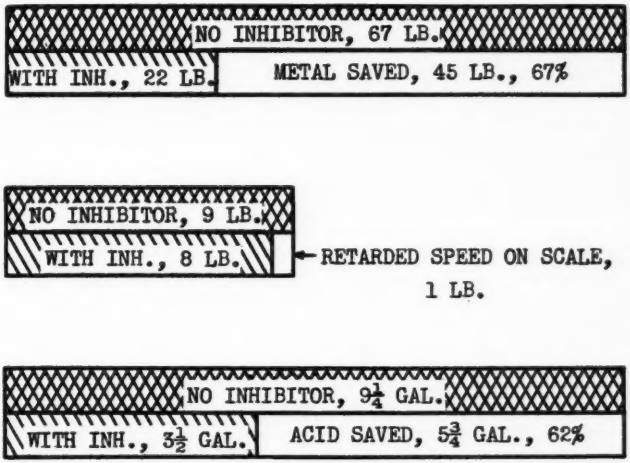
NO INHIBITOR, 67 LB.
WITH INH., 22 LB.
METAL SAVED, 45 LB., 67%
NO INHIBITOR, 9 LB.
WITH INH., 8 LB.
RETARDED SPEED ON SCALE, 1 LB.
NO INHIBITOR, 9¼ GAL.
WITH INH., 3½ GAL.
ACID SAVED, 5¾ GAL., 62%

Fig. 1—(Above) Illustrating the effectiveness of inhibitors for conserving metal. (Center) Illustrating the effect of inhibitors on the action of the acid on scale. (Below) Illustrating the effectiveness of inhibitors in conserving acids

### Solvent Degreasing

First, in many plants the operation of degreasing equipment is not used at top efficiency, resulting in solvent loss. The most serious loss is that of drag-out, and vapors escaping. Time plays an important part in all cleaning, and is reduced to a minimum in solvent degreasing due to the fact that no chemical reaction takes place. If the machine is not designed properly, and the heat input is not sufficient, loss in solvent will take place. If the temperature of the parts being degreased is not raised to the boiling point of the solvent in a minimum time, the material will be withdrawn wet, resulting in loss of solvent, or the parts will have to stay in the degreaser until heated to this temperature, which will take more than the allotted time.

The common causes for loss of vapor can be caused by drafts across the tank, putting in too large a bulk of work displacing the vapor, and withdrawing the work from the machine too quickly, disturbing the solvent vapors. The work should be removed from the machine slowly not exceeding 11 feet per minute.

### Pickling

Many of the control methods mentioned previously under alkaline cleaner control are applicable to the control of acids dips. Maintain the acid concentration by titration with

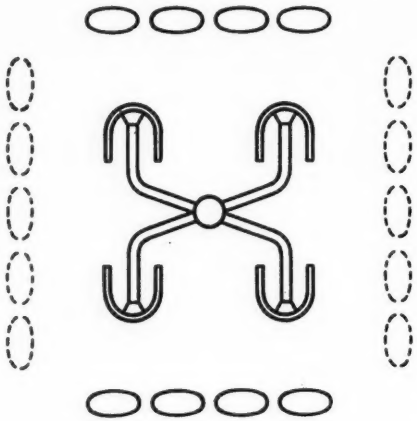

Fig. 2—Illustration showing proper racking of parts which do not require inside plating

a standard alkali. Prevent contamination of the acid dips with grease and oil by providing proper cleaning methods. Occasional carbon treatment of the acid dips may prove practical if shortages occur of the common acids. Operate acid dips at lowest concentrations possible, to prevent dragout and greater spray losses.

Use inhibitors which will permit the removal or rapid solution of the various scales or oxides, and retard the action of the acid on the metal.

The mechanism of an inhibitor is that the inhibitor, being a finely dispersed colloid, will surround and adhere to the metal. The pickling acid will react on the scale and form a ferrous or ferric salt, which dissolves in the bath. Its action on the base metal, which ordinarily liberates hydrogen, will not occur to as great an extent, since the inhibitor prevents this hydrogen formation or further oxidation. The inhibitors, therefore, have a definite effect upon hydrogen embrittlement.

To sum up the functions of an inhibitor, it may be said that:

(1) It does not interfere with the normal operation of the acid.

(2) It prolongs the life of the acid, since less metal is dissolved and the amount of the iron salts accumulated is smaller.

(3) It saves the base metal, and helps to prevent over-pickling.

(4) Not only does it prevent embrittlement to a great degree but it also helps to preserve the bright, smooth original iron or steel surface, and thus aids in obtaining smoother, brighter electro deposits.

The effectiveness of inhibitors in conserving acid and to action on scale can best be seen by the diagrammatic illustration designated as Fig. 1.

### Plating

The different sources of losses may be classified as follows:

1. Poor plate distribution on the work.
2. Plating on racks, barrel, and tank sides.
3. Drag out of plating solution.
4. Contamination, decomposition and purification of plating solution.
5. Rejects.

### Plate Distribution

It is well known that the thickness of the plate may vary from load to load in a tank, from piece to piece on a rack, and from point to point on a piece. Considerable savings can frequently be accomplished by increasing the uniformity of coating.

### Variations in Thickness From Load to Load

These variations appear both in still tanks and in barrels, and are

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caused by variation in time or current. Time variations are difficult to avoid, unless timing equipment is employed.

Variations in current must be prevented by the operators. To assist them, current charts should be prepared for the different parts plated. These charts should preferably be based on a tank load consisting of certain number of racks or pieces.

### Variations in Thickness from Part to Part

In barrel plating the uniformity of plate thickness is governed mainly by three rules. Only a certain proportion of the total load is being plated at one time, namely, those parts which are in the direct path of the current. Those toward the center of the load are shielded by the parts surrounding them, and do not plate at all unless the rotation of the cylinder brings them to the surface. This takes place only when the cylinder is half filled or less. If more work is put into the barrel than one-half of its total capacity, the center portion of the load stays in the center, while the work on the outside rolls around there. Thus, the first rule for uniform plate is this; never, fill the barrel cylinder more than half full with work.

Another factor of importance, is that the individual pieces must tumble fairly freely. Parts which nest together, such as open helical springs, and parts which stick together, such as light flat parts and cup shaped parts of the same curvature, cannot be barrel plated satisfactorily unless other parts can be mixed in with the load to break it up. The second rule is, therefore, do not barrel plate parts which stick together during plating and expect to get good plate distribution.

Finally, the work must make good contact with the cathode dangler.

In still tanks or in automatic plating, variations in thickness from part to part are caused by three factors; namely, No. 1 varying resistance in the electrical contact, No. 2 varying resistance to different portions of the rack and No. 3 varying space relations between different pieces in the tank and between these pieces and the anodes.

### Variations in Thicknesses From Point to Point on Individual Part

To properly discuss this general heading, it is necessary to consider the plate distribution. I think of no better illustration of plate distribution, than the demonstration that Walter Pinner of General Spring & Bumper Corporation gave on the importance of proper racking of parts, which do not require any plating on the inside. An illustration of this arrangement is shown in Fig. 2.

Since his discussion is very much to the point, it is quoted almost verbatim.

The articles portrayed in the illustration may be any one of dozens of metals, stampings, or castings. They may be hub caps, door handles, bumper guards, radiator grilles, pots or pans. Specifically, they represent formed metallic articles having an outside, significant surface to be plated to a thickness specification. The inside is not significant and, constituting the back, is not polished and is preferably not to be plated.

Fig. 2 suggests an article having three significant surfaces and in which the linear dimension of the face is approximately equal to the dimensions of the two sides. The anodes, represented by the dotted lines, are placed in a manner actually noted by the author in an otherwise well regulated plating plant.

With only a casual study of the set-up shown, several conditions will be seen to be incorrect. Bearing in

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mind that these pieces are being plated to a thickness specification, it is at once obvious that each of the four pieces will be plated to a certain thickness on the sides nearest the anodes. This thickness will prevail

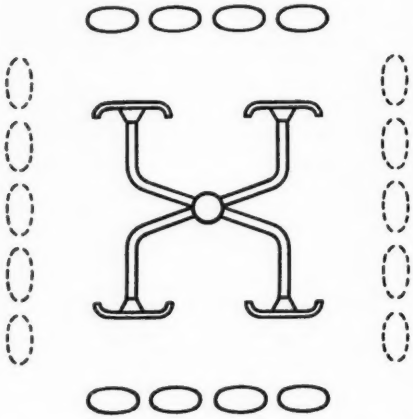


Fig. 3—Illustration showing proper racking of parts requiring plating on front face and two side faces

around a large part of the front of the piece and then diminish to a low value on the other side, opposite which there are no anodes. Obviously, if the rack be turned 90 deg. from its present position, facing the solid lined anodes as shown, better plate distribution will be obtained. The plate, dependent upon the actual size of the articles and the distance of the front of the pieces from the anodes, should be fairly uniform, depending, in turn, upon the spacing of each piece to its neighbor.

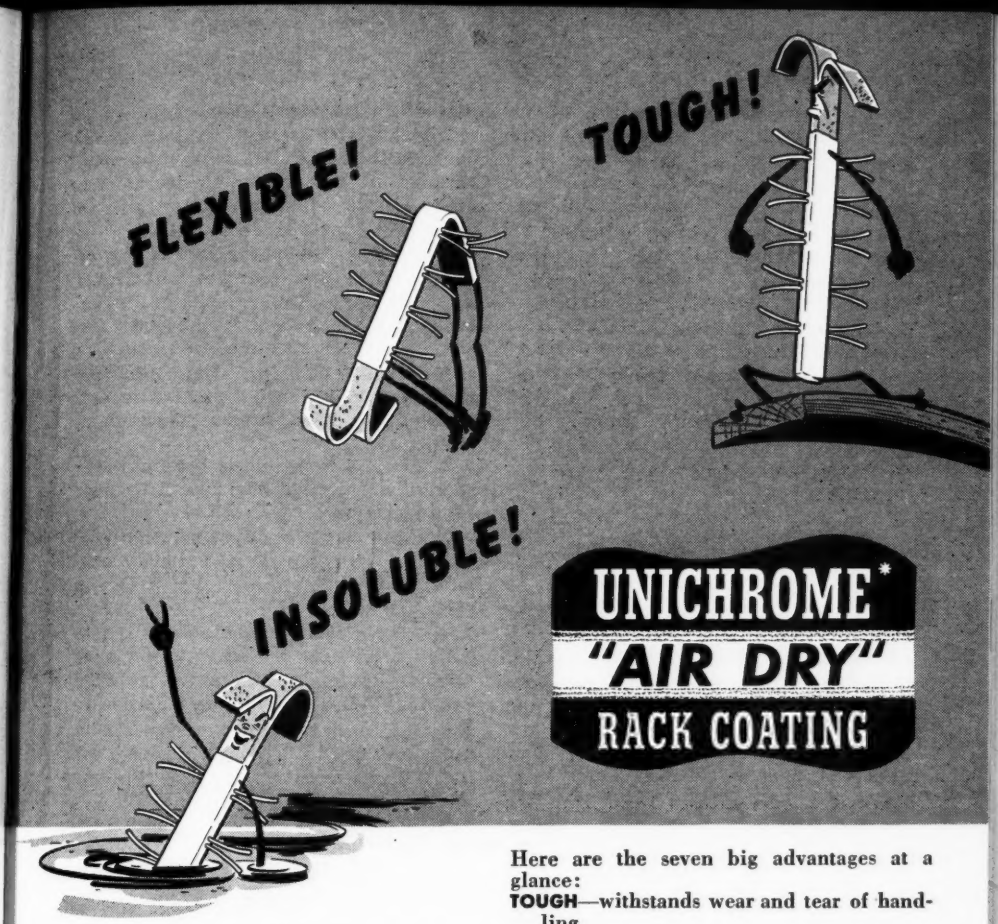
With this spacing determined, and anode to cathode distance fixed by plate thickness measurement, one other fault remains to be adjusted for sake of economy. The pieces should be moved more closely together, back to back, to prevent the waste of anodes on non-significant surfaces. In general, such pieces should be racked as closely together, back to back, as is physically possible to accomplish.

Fig. 3 presents pieces, racked for plating, which again may be any of countless fabricated articles. In this case, the front dimension of the pieces is relatively large as compared to the side dimension. Again, the back is a surface not to be polished or plated upon. It is hardly possible that any well-informed plater would process the pieces in the position shown as regards the anodes shown in solid lines and yet such practice would not be as ill-advised as the set-up originally shown in Fig. 2. In such position, the plate thickness on the front, constituting the most of the surface, if meeting the thickness requirement, would leave only a small section overplated and a small section underplated.

Obviously, the proper set-up is that represented by the anodes shown as dotted lines, and again one need be careful only of the spacing of each piece to its neighbor and, as before, the pieces should be moved closer together, back to back.

Fig. 4 suggests pieces having the side dimensions large in comparison to the front dimension. Two pieces only are shown on one plating figure. The author can conceive of no way to place four such pieces on one rack, and obtain proper plate distribution with a normal anode to cathode distance. With only two pieces on one rack spline, the operator needs only to space the piece properly with relation to its neighbor on the next spline in order to obtain good plate distribution. Obviously, with the cathode dimension narrow, an additional cathode compartment may be set up and utilized in a tank of any given width.

In the foregoing illustrations, the articles shown consist of plain surfaces. Logically, deviation from plain surfaces into intricate design further complicates the picture. However, it

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is usually possible to classify articles in some one of the above three and employ the general principles outlined. Departure from plain surfaces involves the use of increased ingenuity and more careful examination of results obtained by plate thickness measurements.

Properly constructed and maintained barrels do not tree. Electrical contacts should be removed for de-plating at regular intervals. When they would be attacked on stripping, that is, if they are chromium plated, they should be cleaned mechanically and the scrap kept separately for remelting or exchange.

### Drag-Out of Plating Solution

Drag-out is solution adhering to the work and transferred with it to the next tank, or ordinarily to a rinse tank in which it is lost.

The volume of the drag-out increases with the speed with which the work is removed from the solution, decreases with the time of drainage above the solution, and varies with the shape and size of the part. Cup shaped parts drag out the biggest volume of solution, short flat parts in vertical position the least. If parts drain on each other, the drag-out is increased. The volume of the drag-out generally varies between about .4 gallons per 1,000 sq. ft. of work for perfect drainage, and 24 gallons per 1,000 sq. ft. for some cup-shaped articles.

Studies of drag-out by the writer and others have shown many ways in which drag-out can be minimized.

1. Use as dilute plating solutions as possible to minimize viscosity, and to keep the cost of the drag-out at a minimum. This is particularly necessary when thin flash coatings are applied. Such coatings carry with them as large a volume of drag-out as heavy coatings and the ratio between metal lost by drag-out and used in plating is tremendous.

2. Allow the parts to hang on a rod over still tanks or semi-automatic throughout one cycle of operations, and to pass over an empty tank in a full automatic when possible.

3. Remove the parts slowly out of the solution and transfer quickly if total transfer time must be short. Make the racks light to conserve the strength of the operator.

4. Parts which go deep into the tank should be removed slower and allowed to drain longer than short parts.

5. For minimum drag-out the parts should be extended horizontally rather than vertically.

6. Rack parts so that solution can flow off at a tip or a corner. Avoid having flat horizontal surfaces on the rack.

7. Empty cup-shaped parts carefully after their vertical surfaces have drained, or still better, provide drainage holes large enough to empty the cup completely during the drainage time. See to it that drainage holes are not closed after dies have become worn.

8. Stream-line the racks and keep them in repair to avoid pocketing of solution.

9. Never rinse a plating barrel. Rotate it a few times by hand after it has been raised out of the solution.

10. Where warm plating solutions are used in full automatics, make up for exaporation losses by spraying a fine mist of water and air on the parts while they are still above the tank.

11. Place drainage boards leaning toward the plating tank, between it and subsequent rinse tanks, in full automatics.

In many instances, a part or nearly all of the remaining drag-out may be saved. The following means are suggested:

Use at least one drag-out tank of a minimum volume immediately fol-

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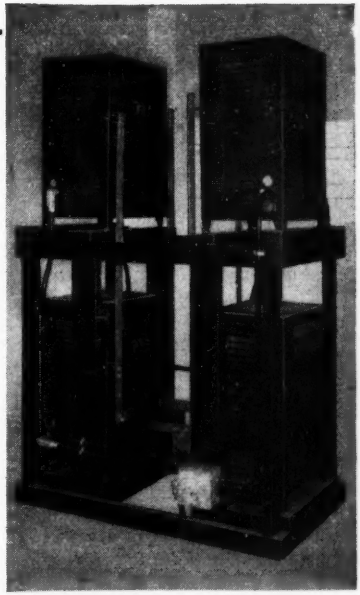

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lowing the plating tank. When expensive or very scarce metals are plated, use several drag-out tanks in a row. Use the solution in the first drag-out tank to replenish evaporation and spray losses from the plating tank. If the plating solution is operated cold and evaporation is slow, evaporate the first drag-out solution at intervals using waste steam if available, and add the concentrated solution to the plating tank. Use a low evaporation temperature for cyanide solutions and remove carbonates before adding to the plating tank. Silver and gold may be precipitated with zinc dust and sold to refineries. Cadmium may be plated out on steel dummies which are used as anodes in the plating tank. As the first drag-out tank is emptied, fill it with solution from the second drag-out tank, and so on, and add clean water to the last drag-out tank.

Chromic acid spray should be recovered with a moisture extractor placed in the ventilating duct as far away from the plating tank as possible.

### Contamination, Decomposition, and Purification of Plating Solutions

Materials which contaminate plating solutions, and decomposition products of bath constituents, are frequently removed at a sufficient rate by means of the drag-out in order to avoid frequent purification. When drag-out is reduced or eliminated, these substances may accumulate so fast, as to make frequent purification necessary. Since purification is frequently accompanied by considerable losses, it is necessary to take steps to prevent such losses. This can frequently be done with very little effort.

The first step in preventing contamination is to recognize the nature of the contaminant and determine its source. The action of most inorganic and some organic impurities is well known. A list of common paths of contamination is as follows:

1. Parts fall to the bottom of the tank and dissolve chemically, anodically, or as intermediate electrodes. They should be removed at regular intervals. Since such removal stirs up sludge, it should be done at the very end of working periods.
2. Foreign solutions drip into the tank from barrels or dripping baskets crossing overhead, from the floor above, and so on.
3. Solution splashes from one tank to another.
4. The same rinse tank used subsequent to plating with one solution, is also used before plating with another solution.
5. Fumes from one tank, notably chromium tanks, are blown into another tank, sometimes from one end of a building to another depending on prevailing winds.
6. Drippage of solution on anode rods and work rods causing them to dissolve.
7. Lead is dragged in from a lead-lined tank with muriatic acid or dissolves from lead coils.
8. Inexperienced help makes the wrong additions.
9. Improper tank linings, rack coatings, insulation on electric cables, filter hose, and so on, dissolve in bright nickel solutions.
10. Cleaners and pickling acids enter the plating bath because of insufficient rinsing.
11. Oil is brought into the bath from insufficient cleaning, or reprecipitation on the work in the acid dip due to insufficient rinsing.
12. Oil is sprayed into the tank from leaking air lines.
13. Polishing dirt settles in the tank.
14. Wetting agent in a previous bath is not removed from the surface of the work.

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Two types of plating solutions suffer from decomposition, namely cyanide solutions and solutions containing organic addition agents.

The decomposition of cyanide so-

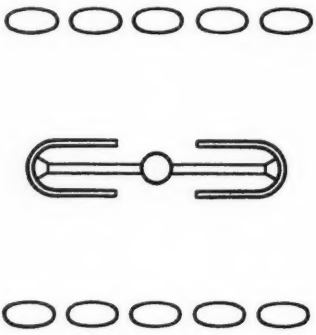

Fig. 4—Illustration showing proper racking of parts which have large side dimensions in comparison with the front dimensions

lutions and consequent formation of carbonates is minimized by:

1. Operation at as low a bath temperature as possible.
2. Operation at maximum pH.
3. Avoidance of air agitation.
4. Avoidance of use of insoluble anodes alone.

Addition agents should be chosen so as to assure their stability in the bath.

When purification must be undertaken, great care is necessary to avoid large losses. Some important points are:

1. Use tanks with sloping bottoms and sumps at the end from which the solution is pumped.
2. Maintain the filters and save all solution leaking out of filter presses.
3. Avoid the losses which occur when the filter is taken apart unnecessarily by (a) using low filtering pressure which minimizes clogging and (b) settling the sludges in the tank by the addition of filter aid before filtering.
4. Drain filter and pump after use into a drum and keep this solution until the next filteration.
5. Do not wash the filter cake after carbon filtrations or use the wash water without repurifying it before it is added to the tank. It may contain the impurities just removed.
6. Avoid precipitation of nickel salts when raising the pH for purification. The impurities precipitate at a lower pH than the nickel.
7. When dummying, plate out as little metal as possible with the impurities by (a) using nickel plated steel screen dummies (10 min. nickel is sufficient) or corrugated steel dummies, (b) providing maximum agitation, for example with a circulating pump, and (c) controlling the current density so that the dummies are black at all times.
8. Drain frozen out carbonates quickly and well, and drain sludges well before throwing them away.

## Rejects

Almost everything which will reduce the percentage of rejects pays its way. Three general methods are suggested which should be used simultaneously.

The first method involves inspection prior to plating and rejection of parts which show faults which cannot be rectified in the plating room. Rackers, properly chosen and trained can often do all that is necessary, at small additional cost.

The second method deals with continuous control of all solutions. A single analysis does not tell very much unless it can be compared with previous analyses and co-ordinated with other facts of operation. Some simple bookkeeping is necessary. The following information should be available for each bath:

Tank number

Capacity in gallons to standard solution level,

1 oz. per gal ..... lb. per tank.

Regular schedule of all additions, including salts, anodes, brighteners
Regular schedule of analyses
Standard bath composition
Result of analyses with dates
All additions made with dates
Work run in tank-type, quantity, specification, thickness test results and dates.
Voltage at generator and tank and amperage if possible with dates.
Space for remarks.

This sort of data, religiously kept will provide much help in keeping production going in a satisfactory manner.

The third method depends on inspection of all rejects from the plating room. A well organized, detailed reject report is an invaluable means of control. The inspector should be taught by the plating foreman to recognize each kind of fault which may be the reason for rejection. That is time exceedingly well spent. He should then be given slips of paper with the inspector's name, the date and the shift, on which are already listed these reasons for rejection, and make a mark before the proper one when a part is rejected.

At the end of the shift, each column is added and the total is ascertained. By keeping a record from shift to shift and from day to day, trends will be observed which can be corrected before things go bad. Not only will it indicate what happens to the various solutions, but it will also put responsibility on the operators, if the work is properly subdivided among them. Furthermore, faults in base metals and previous operations are indicated and can be corrected. Such detailed rejection reports are also helpful in establishing the time period between purification of plating solutions, dumping of cleaners and acid, and similar all-important control measures.


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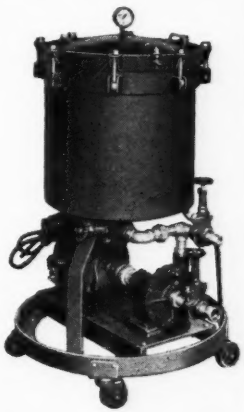

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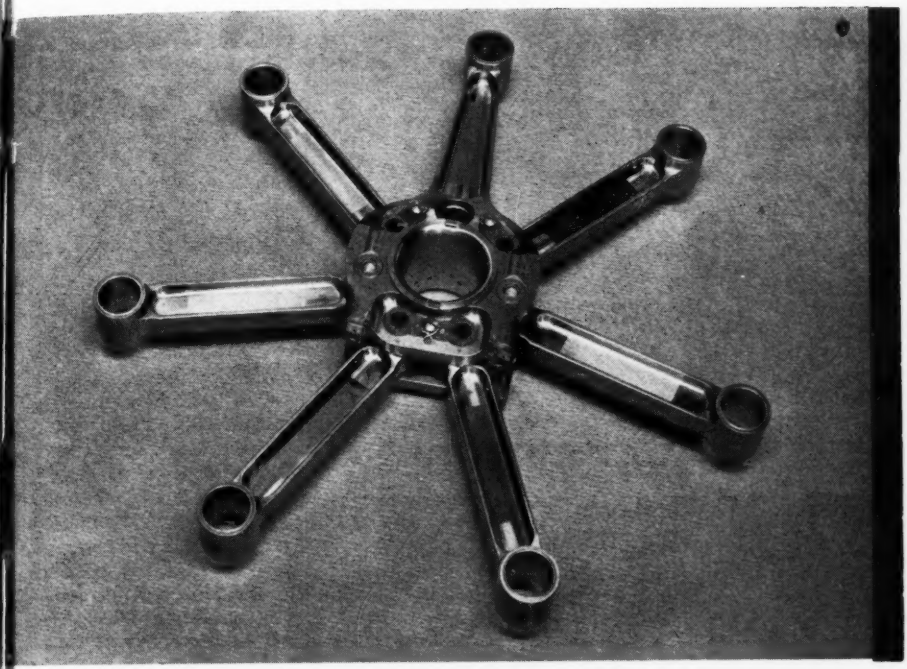

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By C. A. GAMMON

General Car Foreman, Florida East Coast Railway

THOSE who customarily take winter sojourns to Florida resorts and other vacation points in the deep South, probably give little thought to a railroad's maintenance problems, as they roll along, relaxed in comfortable, deep-cushioned chairs within air-conditioned, streamlined trains, where even the walls and ceiling are designed to give rest and satisfaction to those seeking renewed strength or exhileration. To take but two of the outstanding problems — there is the road itself, and that of keeping the rolling stock in condition for safety, beau-

Fig. 1—Cleaning the ceiling of a dining car before spray painting.

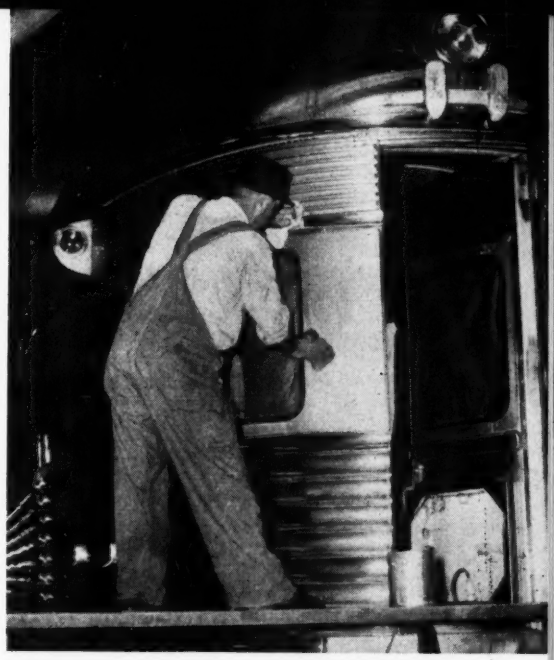

Fig. 2 — Cleaning and polishing the chromium-nickel stainless steel surface on the coaches of streamliners.

ty, and comfort.

How many give thought to the great change that has taken place along that now famous East Coast of Florida during the period of an average lifetime. In the early 80's that entire coastal stretch south of St. Augustine was but sparsely settled, while south of Daytona there was hardly a settlement of any importance. Until 1883 no railway existed between Jacksonville and St. Augustine, while farther south, travel was chiefly by sailboat on the bays and rivers.

As the vast reaches of the great West were opened to development and settlement by the steady advance of the railroad, so also has the Florida East Coast developed and played an all-important part in the prosperous growth of the South, as it advanced from point to point down along the coast, until it finally bridged the ocean to Key West.

The keeping of the rolling stock of the Florida East Coast Railway in the pink of condition is all done at the railway's Miller Shops in St. Augustine. Among the buildings on the shop premises is one devoted to car painting and finishing. This building, fire-proof throughout, is of steel construction, faced with hollow tile stucco, 385 ft. long and 110 ft. wide, with a cement floor and a saw-tooth roof. Four tracks run through this building, each accommodating four passenger cars, or a total of sixteen.

Fig. 3—Masking windows and interior trim prior to painting.

The cars are moved along these tracks by means of an electrically operated car puller, using steel cables. The staging, or scaffolding, along each track is of the counter-balance type which one man can handle and adjust to any desired working height. The shop is well lighted and ventilated, being equipped with a hot air drying system that can be regulated to any desired temperature. Since in the painting of steel equipment it is important that all surfaces to be painted are at or above room temperature to avoid any possibility of condensation of water vapor on the steel surfaces, humiguides are installed at different points showing the relative humidity.

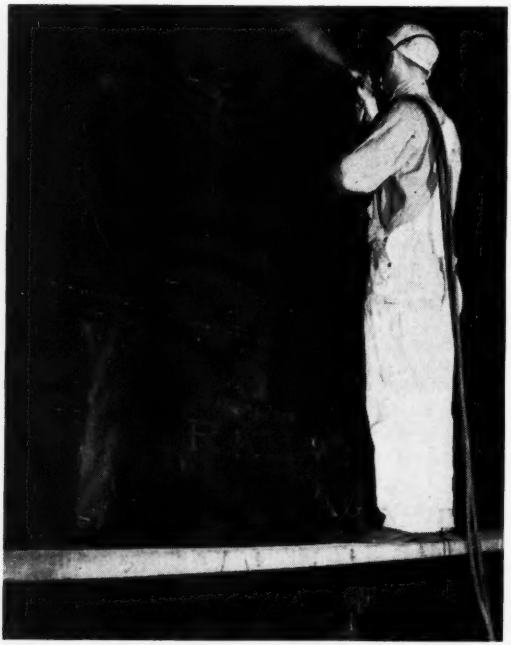

Fig. 4—Working from adjustable scaffolding in spray painting exterior of a baggage car.

The painted surfaces of cars in this location require a little more attention than those of cars operating in the interior sections of the country, since the road follows the coast and the salt water atmosphere has some effect on the finish. Yet, it has been found that when the cars are given proper attention, the finish will hold up very well for some fifteen or eighteen months.

Generally speaking, two methods of painting are employed here in the Florida East Coast's Miller shops—namely, general repairs and light repairs. On steel equipment general repair work consists of removing all old paint, rust, and other foreign matter from the exterior surfaces of the car by sandblasting or with paint remover, after which the car is sprayed with a prime coat. This is followed by puttying and an initial coat of surfacer. After this, the car is knife-glazed and given a second coat of surfacer, followed by hand-rubbing with wet-or-dry sandpaper and water, procuring a smooth, even surface for the finishing coats.

Two spray coats of Pullman standard green body color are then applied, after which the car is lettered and striped. This is followed by an application of two spray coats of clear finishing varnish. A drying period of from eight to twelve hours is allowed between the various coats. As a car is receiving the various spray coats, the roofs, trucks, steps, and platforms are finished separately with coats of primer and paint. For all painting operations 5-gallon pressure tanks are used, and drying is done at regulated room temperature.

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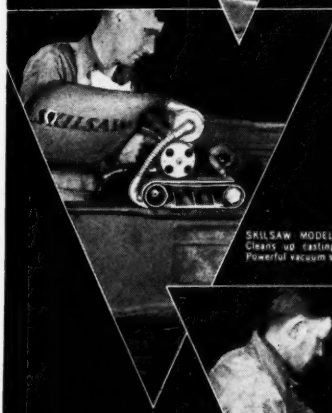

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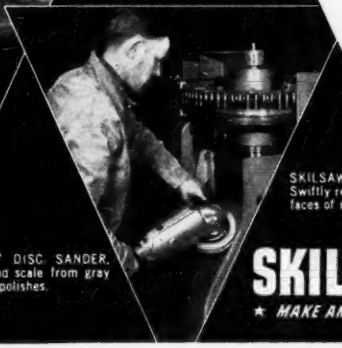

SKILSAW MODEL "N" DISC SANDER. Quickly removes fins and scale from gray iron castings. Buffs and polishes.

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Where only light repairs are required, a thorough cleaning is given the car, after which it is touched up and revarnished when necessary and returned to service as quickly as possible.

ments. For instance, one coach will have olive gray walls and a fog gray ceiling with olive buff ceiling stripes. The men's lounge, women's lounge, and hostess' room are in light gray and slate gray green. Another coach

Fig. 5—Here, in this observation end of a streamliner, the opal green of the center ceiling blends with the French gray of the side ceiling, and into the deep grayed brown of the walls, to make a pleasing, soothing color combination.

In cleaning and painting the new lightweight streamlined equipment (the sides and roofs of the cars being in bright, stainless steel with black lettering on the letterboard) the exterior surfaces are cleaned with a stainless steel car cleaner, the trucks and other underneath parts being painted black. Engines are painted in a pleasing combination of red and yellow for the body, with black for the apron and trucks, and stainless steel trim.

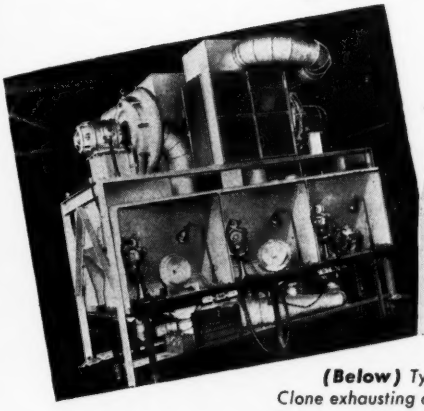
The interiors of the streamline coaches, dining and tavern-observation cars, are finished in various shades and pleasing color combinations which blend in very effectively with the modern lighting arrange-

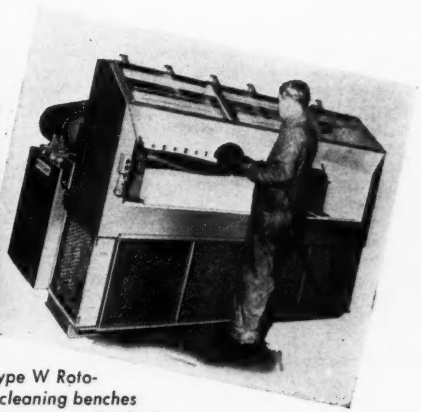
will have slate gray green walls, light gray ceiling, with greenish blue ceiling stripes; the men's lounge in light gray and slate gray green, and the women's lounge in a combination blend of fog gray and olive gray.

The tavern car may have gray side walls and ceiling with burnt yellow center ceiling and light gray brown beneath the windows, while in the observation end the walls are deep gray brown with a French gray side ceiling and opal green center ceiling. In the diners the deep blue walls blend with the buff tan ceiling trimmed with yellow cream stripes and a mist white center band.

Interior fixtures, such as sash and other parts of the car trim are

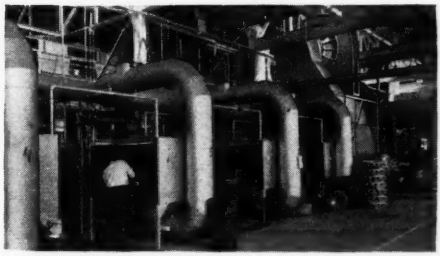
# EFFECTIVE DUST CONTROL KEEPS PRODUCTION LINES MOVING *Faster*





***(Below)*** *Type W Roto-Clone exhausting cleaning benches where magnesium castings are finished.*

***(Above)*** *Roto-Clone combined exhausters and dust separators may be had as self-contained units comprising a dust storage hopper and filter to clean the exhausted air so it may be recirculated into the workroom.*



***(Above)*** *The war has necessitated many special applications of Roto-Clone dust control units such as this airplane propeller grinding bench equipped with Airmat P-L after cleaner filters for air recirculation.*

Vastly accelerated delivery schedules in all industries, especially those directly engaged in war production, have brought the problem of clean air to the forefront of production planning. Men who operate machines must breathe freely of clean, wholesome air and those machines must be protected from the ravages of dust that deteriorates the best of equipment and spoils materials in process. • Write today for "AAF In Industry," a new bulletin describing the complete line of American Filter equipment.

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handled in one section of the shop where, after suitable preparation they are sprayed with lacquer. Certain parts of the trim are painted with enamel and baked in an oil-fired oven for approximately two and one-half hours at a temperature of from 180 degrees to 200 degrees Fahrenheit.

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**Oakite Service Data.** A special five-page digest which reviews materials, methods, and procedures used for effectively handling 28 essential, commonly recurring maintenance jobs has been issued by Oakite Products, Inc., 20 Thames St., New York, N. Y. Prepared for plant maintenance superintendents, safety engineers, and other executives, the digest, in data sheet form, provides many ideas and suggestions for speeding certain jobs, conserving man-hours, increasing maintenance efficiency, improving plant safety, and shortening "down time" for equipment.

Many different types of maintenance work are discussed, such as cleaning tool and machine parts, gears, sprockets, and a wide range of similar equipment before repair and overhaul; cleaning cutting oil and grinding solution lines and systems; descaling Diesel and gasoline engine cooling systems; cleaning air filters; cleaning ammonia condensers, feed-water heaters, and other water-cooled equipment; removing carbonized oil and sludge deposits from heat exchange units without dismantling, and so on. On each of the 28 different types of work is outlined the material used and method followed, the time saved, the fire or other hazards eliminated, or other advantages gained. Copy of digest free upon request.

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**"Here Are the Answers to Ninety Per Cent of Your Problems in the Use of Coated Abrasives"** is the title of an eight-page folder by E. B. Gallaher, M. E., which is now being distributed by the Clover Mfg. Co., Norwalk, Conn. Treated in the folder are common causes of failure in coated abrasives, method of protecting coated abrasive stocks, losses caused by improper storage, losses due to improper operative methods, and effect of humidity on flexibility. Copy free upon request.


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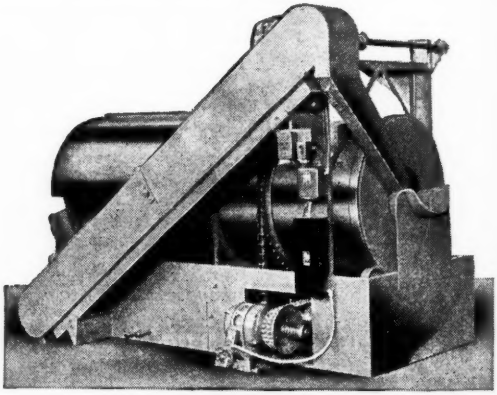

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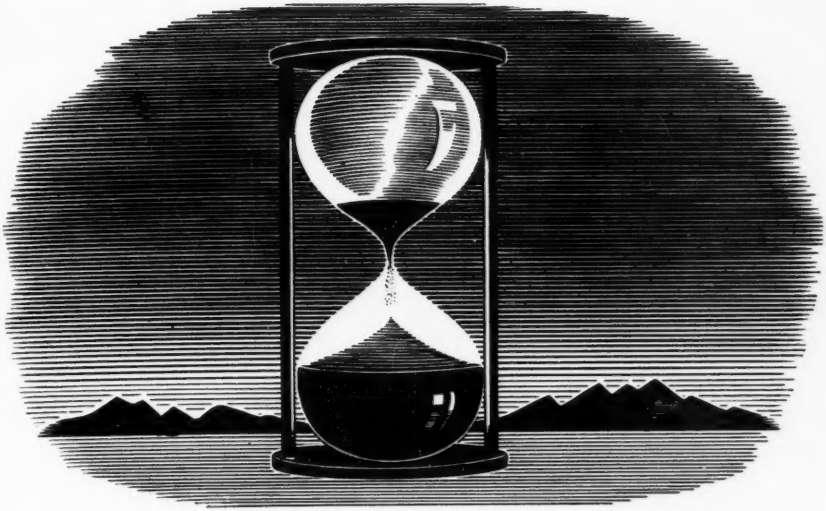

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# Modern Gold Plating — Part 22

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

AT THIS moment in our history, when every scrap of metal is valuable and waste is a cardinal sin, the subject we are going to discuss assumes trebled importance. While addressed primarily to gold platers, it is a subject that should be taken to heart by every plater throughout the land who has not already done so, not only in the interest of Victory but in self interest as well. It is the subject of racks.

Since the beginning, gold plating has been done by stringing the work on copper wires to obtain both support and electrical contact in the plating solution. Though it is at least ten years now since plating racks for nickel and chromium plating were introduced to the plating industry by progressive manufacturers, the use of the plating rack has not caught on, particularly for electrogilding, except where enlightened management has insisted on its adoption. The advantages in using an insulated plating rack over bare copper wire, for gold plating or for that matter for any other kind of plating, are so obvious that it seems amazing that their use is not universal in the industry. On a recent survey made of a number of gold plating plants on the Eastern seaboard, the writer found that racks were used in only 1 plant of 29 visited. However, here is one case, where modernization is the patriotic duty of every plater. And it is not painful to be patriotic in this connection either, because not only is valuable metal saved by using racks—time and money are also saved.

### Racks Cut Metal Waste to a Minimum

A plating rack that will hold a number of average sized pieces may use up a pound or two of copper bar stock when made up but from that time on it is good for an indefinite period, particularly if it has been properly insulated. Suppose for example, a manufacturer turns out 30,000 plated pieces a day. To handle the job on racks he would probably need 20-40 racks or about 80 lbs. of copper, let us say. That 80 lbs. of copper works day in and day out; there is no further demand for additional copper.

On wires, the story is different. Once wire has been used to string a load of work, it generally becomes useless for a repeat job as it has become kinked and twisted. In many

cases the wire is clipped right off the load of work to save time. Up to Priority Order M-C-9 the used pieces were generally thrown away or possibly collected if the proprietor thought it worth while, and shipped to a refiner for credit on the gold recovered. In the good old days before the war this was perfectly all right if the manufacturer was willing to foot the bill for this enormous wasteage of copper. Now things are changed. To use wire where a rack will do a regular repeat job, even in shops working on A1A war contracts (not necessarily gold plating) is not only wasteful but thoughtless sabotage of our Victory effort. Let us bring this point home more forcefully with a little illustration.

Take the plant which is finishing those 30,000 pieces daily, for instance. If wire is used for stringing pieces about 4 in. of No. 22 per piece wire is used. You can check on this by taking a few average sized pieces and a piece of wire. Take a couple of twists around each piece to get good contact, allow for a reasonable separation, and a clear space at the top for tieing onto the cathode bar and reaching down a fair depth into the solution. Count the number of pieces wired, straighten the wire and measure its length and you will find 4 in. per piece racked on conservative figure.

The total weight of copper wire this manufacturer uses daily is,

$$\text{therefore, } 30{,}000 \times .0015 \times \frac{4}{12} = 15 \text{ lbs.}$$

Where .0015 is the weight in lbs. of 1 foot of No. 22 copper wire. When you multiply that 15 lbs. by 300 working days in the year or 365 now, you get the not so inconsequential result of 4,500 lbs. of copper or 2¼ tons. That amount of copper could make millions of shell cases. Further-


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more, from the financial viewpoint, at 30 cents a lb. or more the copper cost is $1,350 or more. The man turning out those 30,000 pieces can probably do a better job with 80 lbs. of copper racks, save himself a neat bit of change, and save the copper and the labor that went into producing it, for our all out war effort.

But this metal saving is not the only one involved. How about the metal that is plated out on the wire? That is something to think about too. The writer has just completed the design of a rack for a certain manufacturer who up to now has been using copper wire for stringing his work. The new rack exposes only the area equivalent to ¼ inch of No. 14 copper wire. On wires, this manufacturer has to use about 5 in. of No. 22 per piece plated. The deposit of metal, which happens to be gold, is on the average about .0001 in. thick. What is the saving, if any?

On the wire, we plate out .025 x 3.14 x 5 x .0001 x d oz. of gold, where .025 in. is the diameter of No. 22, 3.14 is pi and d is the density of gold in oz. per cubic inch.

The amount of gold that will go on the rack contacts is, .064 x 3.14 x .25 x .0001 x d, where .064 the diameter of the No. 14 wire and the other figures have the same meanings as given previously.

We can compare the weight of one deposit to the other by dividing.

$$\frac{\text{Wt. of gold on wire}}{\text{Wt. of gold on rack}} = \frac{.025 \times 3.14 \times 5 \times .0001 \times d}{.064 \times 3.14 \times .25 \times .0001 \times d}$$

= 7.8, or, in other words, almost 8 times as much gold goes on the wires as goes on the racks. This holds true whether the plated metal is gold, silver, nickel or copper. That much metal is saved. In the same time 1 lb. of metal is plated on a rack contact 8 lbs. of metal would be plated on wires.

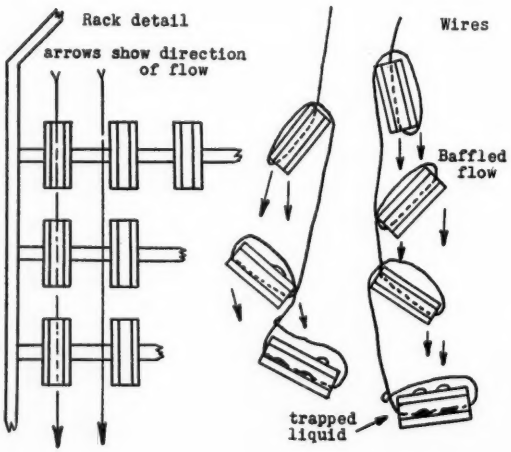


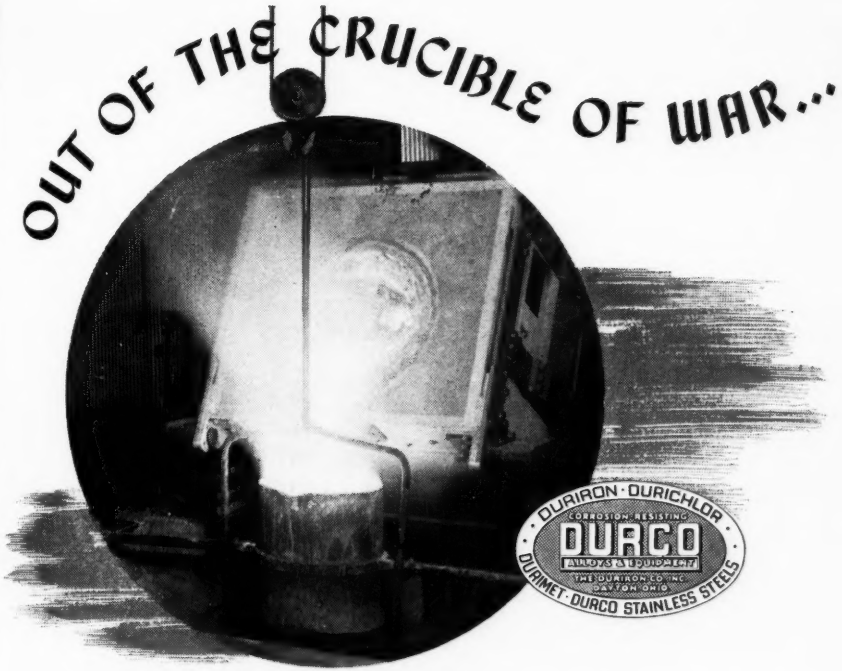

Fig. 1—(Left) Illustration showing drainage of liquid from electric razor heads which are mounted on racks. (Right) Same workpieces hung on wires.

Instances like this are not rare. It can be said without serious contradiction that much more gold goes on the bare copper wires used for stringing pieces than goes on the uninsulated contact tips of racks.

There is another metal saving in using racks, too. This is in reduction of dragout. At first glance, it might appear that the use of a rack would increase dragout materially but this is not so. Well designed racks definitely reduce the dragout loss. Let us see why.

When pieces are mounted on a rack they are rigidly mounted and their directions can be so fixed as to insure the most rapid drainage

# OUT OF THE CRUCIBLE OF WAR...

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of entrained electrolyte. On wires, pieces take random positions, especially when clumped together and act as effective baffles and traps, thus catching and holding a considerable amount of plating solution and materially increasing dragout. The loops and kinks in the wires also tend to hold liquid. An illustration from a paper on the same subject written three years ago by the writer is shown in Fig. 1 and aptly illustrates this point.

Of course, some liquid will cling to the surfaces of the rack but if the rack surface is properly shaped and directed this is still far less than what clings to the kinked and twisted wires. Further, rack coatings made of resinous materials tend to shed electrolyte because they are not easily wet. Another point is that in designing a rack it is possible very frequently to streamline it along lines suggested by Soderberg, so that dragout can be still further reduced. As he pointed out in his excellent paper to the 1937 Platers' Convention, the faster work is pulled out of the plating tank, the more liquid clings to it. In this connection, a well balanced rack is much more easy to handle and amenable to manipulation in leaving the solution than a mass of bunched wires with pieces dangling at all angles.

From the metal recovery standpoint, plating racks offer still further advantages over wire. Where gold is plated on racks, the contact tips can be made removable and can be dissolved to give up their gold. But even this is wasteful since the contact tips, if made of steel or nickel plated copper, can be stripped of their gold directly on the insulated racks by using reverse current in a warm, mild cyanide solution. Thus the gold plated out is easily recovered. On wires, the story if different. Here the copper has to be partially dissolved at least, to recover the gold and besides it becomes a considerable nuisance to collect lengths of copper wire, particularly if they have been clipped into short pieces to facilitate removal from the work. Except for the fact that copper is involved (copper at this moment is literally more valuable than the gold), in many cases it will hardly pay the plater to spend his time collecting the scraps.

### Other Savings With Racks

Insulated plating racks can save their users a considerable amount of time and energy as well as material. In racking pieces, for example, positive contact is assured by either spring tension or pressure. To mount a piece on a properly designed rack only one or two simple motions are required and the same amount of motion is needed to demount it. In wiring pieces, however, the wire must be carefully twisted around each and every piece with at least two turns to insure good contact (which is never a sure thing with wire). This involves a fairly complicated motion. After plating, the same complicated motion must be gone through and, or, a pair of snippers must be used to speed up the job.

Testing on the gold plating rack designed by the writer, previously described, shows that it will take 1 second to mount a piece and 1 second to remove it. A piece wired as it is now, takes 4 seconds to string and about 6 seconds to remove, without cutting the wire. If the wire is cut, the time is 4 seconds. The total overall saving in racking time will therefore be in this particular case, from 6-8 seconds per piece plated. If we use that same manufacturer turning out 30,000 pieces daily, as our guinea pig, he will save himself daily at least $\frac{6 \times 30{,}000}{3{,}600} = 50$ man hours of

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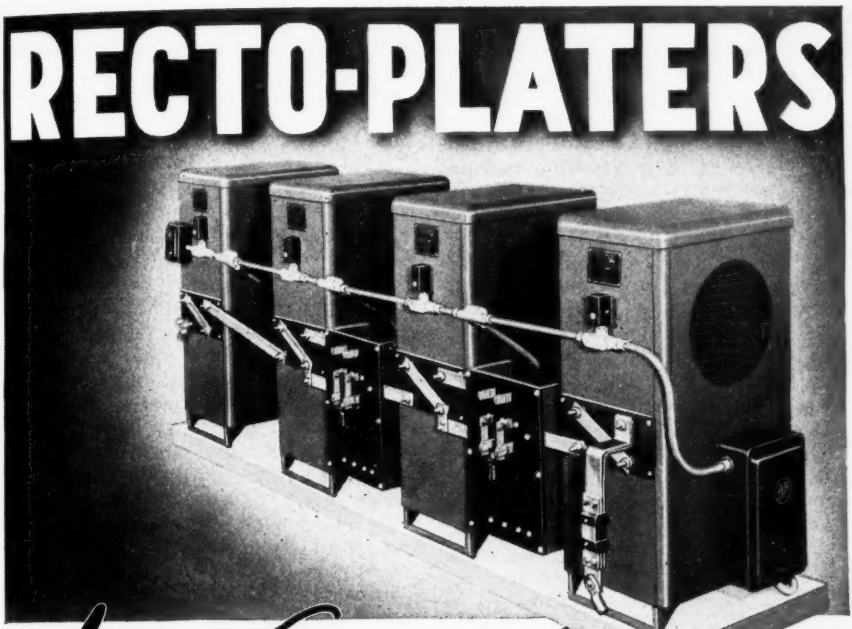
labor. To put it another way, where he had to use 67 man hours of labor, really should call them women hours since women do most of the racking work, for wiring he would need only 17 man hours for racking. Or in even simpler terms, two girls do the work of eight. Naturally, when there are large and heavy pieces to be mounted much of this type of saving vanishes, since in this case only one piece is probably mounted or racked at a time and either operation is just as difficult or easy to do. In the case of small and medium sized pieces, however, cleverly designed racks can effect tremendous savings in labor time and thus free the labor involved for other, more essential work.

Another energy saving feature with insulated plating racks is in the reduction of electrical current consumption. While we realize that this is a rather small factor as far as gold plating is concerned, it it is not so small a factor when it comes to other solutions. Since current flows only to the work, where it is economically employed to precipitate metal on the work, and not to the suspending medium, a definite saving is available. We can make this clear by an example given previously. We showed before that in a certain case approximately eight times as much gold went on wires as went on plating racks carrying the same load. For our discussion, let us assume that in a period of 4 weeks an ounce of gold would have accumulated on the tips of a given rack. This means that wires over the same period would have accumulated 8 ounces of gold. The loss in electrical energy is therefore the amount of ampere hours it would have taken to deposit this amount of gold on the paying work or $\frac{7}{.22} = 32$ ampere hours.

Racks speed up production too because work can be more easily handled and manipulated on racks than on wires. First, a rack can carry a larger number of pieces in a given volume of space than can be carried on wires, without bumping or scratching. The reason for this is fairly obvious. On a rack, the pieces are rigidly mounted and can be distributed most economically in the space available without touching. On wires you have to spread the pieces out in order to avoid bumping, scratching and shading, because of their random distribution. Even in solutions of good throwing power such as gold, a certain amount of separation must be maintained, and the writer has often been amused by the digital antics of gold platers whose fingers had to work like a piano virtuoso's in order to keep five or more strings of work apart in a crowded gold plating bath. When you consider it, it does not seem unreasonable to admit that a plating rack of the right heft, dynamically balanced under full load, should be fairly easier to manipulate than the wires carrying the same amount of work. Since the plating rack is a solid, integral object, the slight increase in weight due to the frame is more than made up by its ease of handling.

It is interesting to note in discussing weight of racks that in the old days when plating racks for nickel and chrome made their first appearance, platers often were justified in complaining about the weight of plating racks. In those days plating racks were made of bare metal. A plater would start with a new rack that weighed maybe two pounds in itself. In a few weeks it would weigh maybe a pound more and not much later the plater would be staggering under the combined load of work and rack. Finally, out of sheer pity for the plate, the foreman or boss would order the rack junked. But those days

# RECTO-PLATERS



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are perhaps gone forever.

Another aspect of time saving or speeding production, is this: it is much quicker to load a rack of work in a tank than a series of wire strings. If you have a rack that holds 100 pieces on it, one motion will put it right on the cathode bar. Where you have the 100 pieces on strings you may have as many as ten strings which would require at least ten motions for putting the load on the cathode bar, not to mention the time out for the old "plater's twist" to keep the string from sliding in and to assure contact with the cathode bar. This may appear to be a small saving perhaps, but in these days when time is the essence, it counts and adds up. If the skilled labor of a plater can be saved and more work done in a unit of time, it should be.

The use of racks in plating tends to give more uniform deposition because a rack can be so shaped to overcome natural causes of poor current distribution. Being s o l i d l y mounted, the pieces can be arranged and distributed to reduce inequalities in current density and accurate current thieves can be used to protect outstanding parts from burning. With wires, none of this is possible.

In plating with gold or for that matter any other metal, the constant removal of gold on the wires and by dragout must be accounted for, or else the bath soon becomes unbalanced. Very often a plater will replenish a bath with what he thinks is a fair amount of gold but he has forgotten about the gold that went out on the wires and in the dragout. Soon this leads to depletion and poor plating. In using racks, these types of losses are held to a minimum and thus the use of racks tends to retard the unbalancing of the gold plating solution.

What are the headaches in racks—now that we have shown the bright side of the picture? We truthfully know of none. Honest. Time was when a manufacturer could kick on the score that it took up a great deal of his staff's time to design and make up the racks, but that one's dead and buried because there are at least three firms who will design and make up racks to suit individual needs, at a reasonable price and in a hurry too.

Then there was the complaint about the poor quality of the insulation on racks which soon disintegrated in the plating tanks and ruined them. But even this malady is more extinct than a Dodo bird, because modern types of insulation are durable, easily repairable and will stand up even in chrome solutions.

Undoubtedly, there will always be those manufacturers who tell you, "we plate such a variety of shapes we can't use racks." Or, they will show you a collection of tiny items strung on wires and defy you to give them a good method for racking them. The answer to the first one, is good old Yankee ingenuity. While one type of rack cannot be expected to hold every possible shape of object, by the application of a little brain sweat a few general types can be designed to hold practically anything produced in the plant. The answer to the second stumper is that the small parts should have been plated in a barrel in the first place.

---

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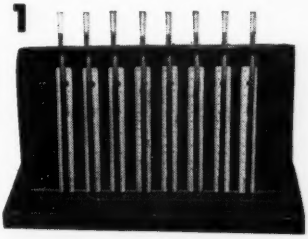

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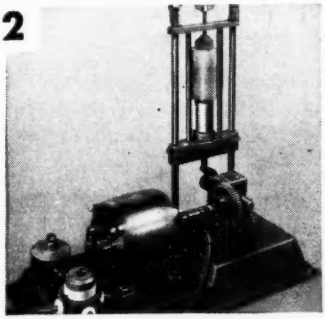

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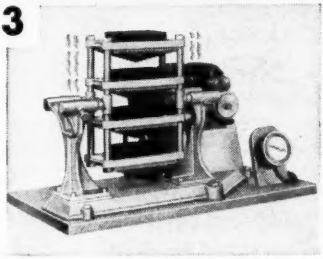

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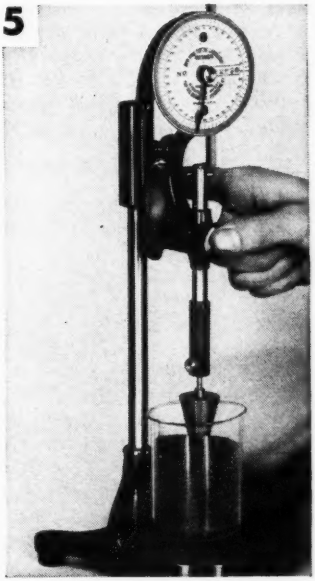

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# *Luminescent Coatings*

## *Report of Sub-Committee No. 43 of the New York Paint and Varnish Production Club—Project No. 6*

THE purpose of this report is to describe luminescent paints and coatings from the standpoint of their known properties and uses at the present time, and to indicate their practical value and limitations. It is designed particularly for those persons interested in the manufacture and use of luminescent coatings. Photoluminescent coatings only are considered, and those containing radioactive materials are not included.

### Definition of Terms

Luminescent Coatings (Excluding Radioactive Materials)—Luminescent coatings are coatings which have the property of converting radiant energy of short wave-length (such as black light) to visible light. They may be further subdivided into fluorescent and phosphorescent coatings.

Fluorescent Coatings—Fluorescent coatings are those luminiscent coatings which emit useful light only during activation by black light. Such coatings may have some afterglow, it is not long enough to be considered of practical value.

Phosphorescent Coatings — Phosphorescent coatings are those luminescent coatings which glow when activated by short wave visible as well as black light, and continue to glow for appreciable intervals after the exciting light source is extinguished. In order to be considered phosphorescent, the afterglow must have a useful length from a few minutes to twelve hours or more.

Phosphorescent coatings are divided into two classes.

Phosphorescent Coatings—Type A —Type A phosphorescent coatings have a high brightness during the first few minutes after excitation ceases and the useful afterglow is relatively short, usually two hours or less.

Phosphorescent Coatings—Type B —Type B phosphorescent coatings have a relatively low brightness shortly after excitation ceases, and the useful afterglow is relatively long, usually from two to twelve hours.

Black Light—Black light is the popular designation for the invisible near ultra-violet radiant energy most commonly used to produce fluorescent and phosphorescent effects. Its spectral range is approximately 3200 to 4200A.

### Fluorescent Coatings

Inorganic Pigments—While a number of inorganic materials are fluorescent and useful as pigments, those of principal practical value are zinc sulfide or combined zinc and cadmium sulfides. Such pigments compare with lithopone or other zinc sulfide pigments in their paint-making properties and characteristics. They are relatively fine in particle size, may be incorporated in binders (vehicles) on standard paint milling equipment and yield normal paints. A range of fluorescent colors extending from green through yellow, orange and

deep red is available. The colors of the pigments in visible light do not correspond to their fluorescent color.

In some cases, organic dyes or other tinting materials are added to modify either the color in visible light or the fluorescent color. The addition of such tinting agents may somewhat decrease the fluorescent intensity. Inerts or extenders of the quality used in paints may also be added to modify the physical characteristics of the liquid paint but only at some sacrifice in fluorescent intensity. Under some conditions of exterior exposure in certain vehicles, there is a tendency to darken with accompanying loss of fluorescence. From the standpoint of toxicity, these pigments are no more hazardous than other regularly used paint pigments.

Synthetic Organic Dyes and Pigments—The most important organic compounds that fluoresce are dyes. Many dyes give a brilliance under black light that is not equalled by any known natural minerals and by very few, if any, luminescent pigments. Dyes in powder form rarely fluoresce as brilliantly as when applied to textile fibers. Luminescent coatings are prepared by dispersing spirit or oil-soluble dyes in binders. The most important groups of spirit soluble dyes are:

Rhodamine — Eosine
Thioflavine — Phosphine
Auramine

The oil-soluble dyes used are limited chiefly to oleates or stearates of fluorescent basic dyes. For greater light fastness but with some sacrifice in fluorescent brilliance, organic pigments are used. They are represented by:

Sodium Red Lake C Toner
Rhodamine Tungstate Lake
Auramine Tungstate Lake


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Metallo organic compounds, as the zinc salt of 8-hydroxyquinoline, have been used in England. Experiments have shown that molybdate lake also fluoresce, and these may assume practical importance in the future. Other organic materials show fluorescence but their practical importance remains to be demonstrated.

While a wide range of shades can be obtained with fluorescent dyes on textiles, at present in formulating coatings the choice of these dyes is limited due to their lack of solubility in nonaqueous media. Chemical modifications to make them spirit or oil-soluble may result in loss of fluorescent properties.

These organic fluorescent dyes have very little resistance to sunlight and consequently their use outdoors must of necessity be limited. Exposure to direct sunlight results in rapid loss of fluorescent characteristics. The Metallo organic compounds are reported to have somewhat improved weather resistance.

None of the organic compounds under discussion show useful phosphorescent properties. Where phosphorescence is desired, inorganic pigments must be used.

Fluorescent dyes are generally considered to have a low degree of toxicity, and have been used in the past in coating compositions without any difficulty in this respect.

Characteristics and Limitations—Fluorescent coatings have been employed in the theatrical field for many years to obtain unusual lighting, decorating, and staging effects. Their potential value for novelties and in the advertising field is recognized. They are being used for direction guides during blackouts on instrument dials, maps and charts where black light activation is practical. The range of colors is wide and the fluorescent brilliance varies with the power of the black light. The usefulness of these finishes is limited by the availability, portability, and cost of the black light units. Fluorescent coatings will pick up to nearly full intensity of luminescence with a flash of activating "black light." In general the faster this pick up, the shorter the afterglow when the exciting light is extinguished.

From the standpoint of durability, fluorescent coatings are quite permanent when used indoors, without exposure to direct sunlight. When used outdoors, or under conditions of exposure to direct sunlight, coatings made with organic dyes are subject to the rapid loss of color and fluorescent properties. Experimental results have indicated that coatings made with inorganic pigments, properly formulated, may retain more than fifty per cent of their fluorescent brilliance after a year or more of exterior exposure.

A lowering of temperature will tend to increase whatever afterglow the fluorescent coating may have.

### Phosphorescent Coatings

The Type A phosphorescent pigments in most common use are zinc sulfide or zinc and cadmium sulfides, and the Type B are calcium sulfide, strontium sulfide or combinations of the two. All phosphorescent pigments are relatively coarse in particle size since their phosphorescence depends upon a coarse, crystalline structure. They cannot be ground on a tightly-set roller mill or a stone mill without a serious loss in their phosphorescent efficiency. They are best incorporated in vehicles by stirring, mixing, or on a very loosely set roller mill. The range of phosphorescent colors is relatively small, Type A pigments usually having a green, yellow or orange phosphorescence, and Type B a violet blue or bluish green phosphorescence. The

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color of the materials in visible light is a dull white, with a grayish or yellowish tinge. Because of their extreme coarseness, phosphorescent coatings do not have very high hiding or whitening power, and occasionally white pigments such as titanium oxide, lithopone, or zinc sulfide are blended with them to supplement these characteristics. At times tinting pigments or dyes are added to modify either their color in visible light or their phosphorescent color. Inert extenders may be added to improve the physical properties of the liquid paint. Such additions should be avoided if at all possible, since they tend to decrease phosphorescence. Because of their extreme coarseness, all phosphorescent pigments have poor gloss characteristics, and a marked tendency toward settling.

Type A pigments behave in paint vehicles in a manner similar to lithopone and zinc sulfide. Type B pigments are quite reactive and are also extremely sensitive to moisture, which destroys phosphorescence. They must be stored in moisture-proof containers and must be used in coating compositions in such a way as to be protected from moisture. Under some conditions of exterior exposure in certain vehicles, there is a tendency for Type A pigments to darken with accompanying loss of phosphorescence. From the standpoint of toxicity, these phosphorescent pigments are no more hazardous than other pigments regularly used in paints. It must be emphasized that this report does not apply to radioactive materials.

Characteristics and Limitations—Phosphorescent coatings also have found application in the theatre for producing unusual staging and costuming effects. Their use in the novelty field has been more extensive


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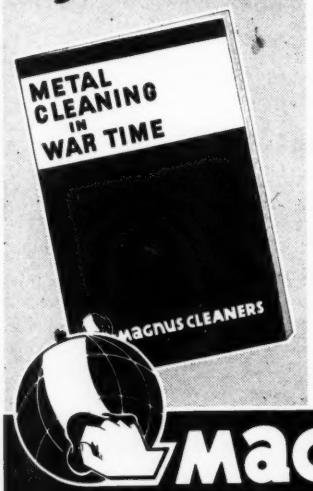


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than that of the fluorescent finishes, and their possibilities for general interior decoration are becoming more widely recognized. They may find further application for **interior** use as markers for exits, guide lines, obstructions, etc., in public buildings, industrial plants, transportation system, air raid shelters, ships and homes during power failure or blackout. For **exterior** applications, the potential usefulness of phosphorescent coatings is somewhat more limited because of the low visibility, as explained later. However, they may find some use on markers, directional signs, large obstructions, and for treating the clothing of pedestrians. The use of phosphorescent coatings in certain phases of camouflage work has been suggested. It must be emphasized that the larger the area painted, the greater the potential visibility and usefulness of these finishes.

It is difficult to make phosphorescent coatings comparable in appearance to ordinary paints because of the coarseness of the pigments, and the lack of color range both in phosphorescent and in visible light. Paints made with these pigments have poor flow; also rapid and hard settling. The Type B pigments must be protected from moisture by a clear film of vehicle, or a layer of glass or other transparent covering.

Phosphorescent coatings are used because of their afterglow. However, the intensity of this afterglow is quite low and its duration is limited, so that the coatings are not always so useful as is desired. The intensity of the afterglow, immediately after activation ceases, is between 1 and 10 per cent of the fluorescent intensity during activation. Phosphorescent coatings are therefore useful only under conditions of extreme darkness and can generally be de-


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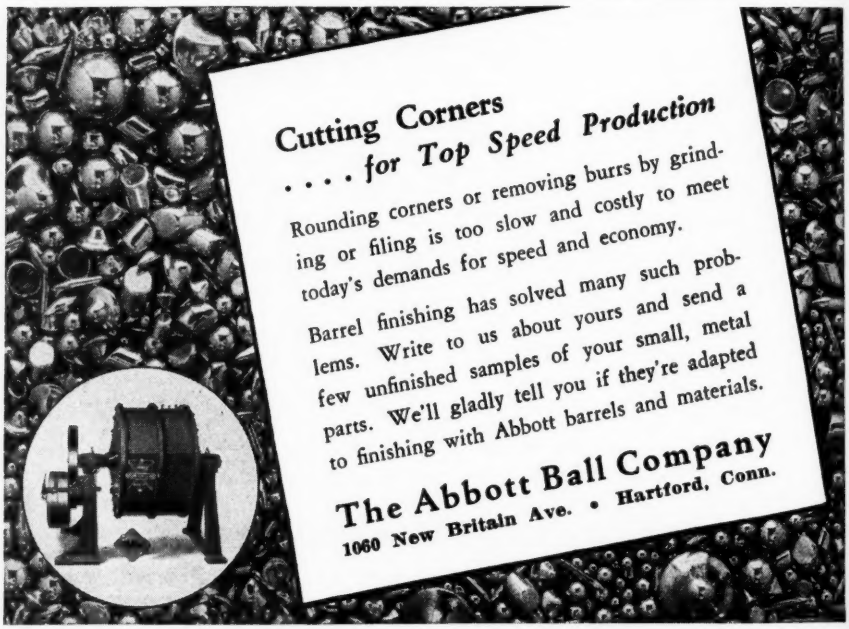
tected only when the eye has become adapted to the darkness.

When used **indoors** where conditions of complete darkness will exist, Type A materials can be seen by the dark-adapted eye for four to eight hours, have a moderate intensity for about two hours and can be readily perceived for one hour. Type B materials can be seen for about 24 hours, have a moderate intensity for about ten hours and can be readily perceived for three or four hours. When used **outdoors** their value in comparison with white coatings will be dependent upon the amount of visible light available. On a clear, moonless night, the amount of light from the sky is sufficient to illuminate a white paint to a brightness equal to or greater than that of most phosphorescent coatings. Only on extremely dark nights or in narrow streets, shadowed by high buildings, do such coatings show a higher brightness than that of a good white paint.

Phosphorescent coatings generally require an appreciable time of activation to come up to full intensity. In the case of Type A materials this time may be from ten seconds to a minute, and for Type B materials from one to ten minutes, depending on the intensity of the light source.

From the standpoint of durability, these finishes are quite permanent when used **indoors.** Experimental results have indicated that coatings made with Type A pigments, properly formulated, may retain more than seventy-five per cent of their phosphorescent brilliance after nine months of **outdoor** exposure. Coatings made with Type B pigments are generally considered useful for not more than six months of exterior exposure.

A lowering of temperature will appreciably increase the length of afterglow and decrease its intensity.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### Binders

The principal requirements of the binders (vehicles) used to make luminescent coatings are:

1. They should be pale in color, and transparent to ultra-violet and short wave-length visible light.
2. They should be practically neutral and non-reactive with the pigments and dyes. Even a low acidity may prove objectionable.
3. They should be non-yellowing on aging.
4. They should have a high degree of moisture resistance.

The binders may be either air-drying or baking types. Herewith is given a list of those which have been reported as having been successfully used.

Air-drying binders (vehicles):

1. Alkyds (drying oil type).
2. Cellulose nitrate and acetate.
3. Chlorinated rubber.
4. Dammar.
5. Highly polymerized drying oil cut with zinc resinate.
6. Maleic ester oleoresinous.
7. Methacrylate.
8. Polystyrene.
9. Vinyl resin.

Baking binders (vehicles):

1. Alkyds.
2. Melamine-alkyd.
3. Urea-alkyd.

For exterior use, binders with good durability characteristics should be chosen. Some alkyds and reduced phenolics may prove objectionable because of acidity.

Driers—Many of the binders used in luminescent paints require added driers to secure the desired drying. Metallic driers should be used in as small amounts as possible. It has been generally found that manganese is the safest drier to use; limited amounts of lead may be used with most luminescent pigments and dyes


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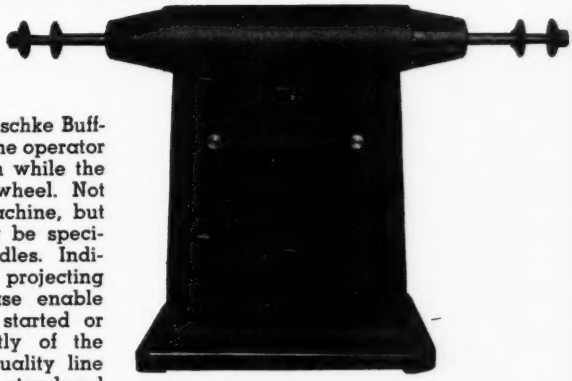

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without impairing their luminescent properties. Some authorities have found cobalt to be definitely injurious. All metals may be injurious to certain luminescent pigments and dyes, and consequently it is advisable to check carefully any drier combination to determine the effect on the luminescent properties of the finished coating.

Solvents—Most solvents commonly used in the paint and coating industry can be safely used in luminescent finishes. However, those solvents should be avoided that have an acid reaction or may decompose to form acids, such as some esters.

Packaging—Very little is known about the influence during storage of metal containers upon the luminescent properties of luminescent paints. The safest known procedure is to use a can coated with baked finish or a glass container.

### Activation

Since fluorescent luminescent coatings have no appreciable lag, only black light with little or no visible light should be used as an activating agent. Suitable sources are mercury vapor, argon glow, fluorescent and incandescent filament lamps. They are generally used with filters to absorb most of the visible light. Because the phosphorescent coatings continue to glow after the activator (light source) has been removed, a true black light is unnecessary. Any of the previous light sources without filters can be used as activators and, in addition, they may be excited by daylight.

Mercury Vapor Lamps — These light sources produce appreciable energy in the black light region and are the most powerful activators available. Because of their line spectra, the energy is more easily filtered to produce black light. The sizes available at present range from 100 watts up to 3000 watts. Each of these requires an individual transformer for satisfactory operation. This consideration may limit their use to more or less permanent mountings and certainly to A.C. circuits. Since mercury lamps require several minutes to warm up, they cannot be switched off and on rapidly.

Argon Glow Lamps—The commercially available argon glow lamps produce very little visible energy, but radiate an appreciable amount of invisible energy in the black light region. They may, therefore, be used with or without filters, depending on the degree of black light desired. These lamps, having low operating current characteristics and operating equally well on A.C. or D.C., may be adapted to operation from batteries and can, therefore, be considered quite portable.

Fluorescent Lamps—These lamps radiate an appreciable amount of black light and are efficient and effective activators. The 360BL lamps are made especially for the activation of **fluorescent** materials. They will, in general, be used with filters to absorb visible light. However, since these lamps give very little visible light and since they operate at relatively low wattages per unit area, it is not necessary that dark heat resisting glass be used as filter material. Pot blue glass is quite suitable for this purpose.

For **phosphorescent** paints and coatings, the ordinary 3500 deg. white, daylight and blue fluorescent lamps are very effective activators. The 360BL lamps may also be used if desired. The linear characteristics of fluorescent lamps makes them particularly adaptable to extended areas such as panel boards, signs, murals, and so on.

Fluorescent lamps are basically A.C. devices. They require a reactor or current limiting device for each

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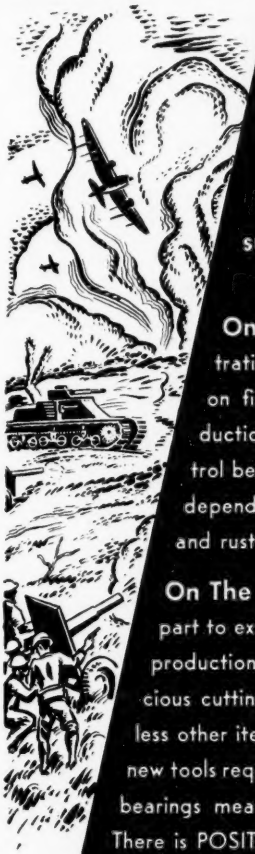

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**On The Battle Front . . .** This deep black penetrating finish is protecting steel propellor blades on fighting planes, its durability and friction reduction qualities lend valuable properties to control bearings and precision parts. Embattled forces depend on Pentrated surfaces for smooth action and rust-resistance on all types of firearms.

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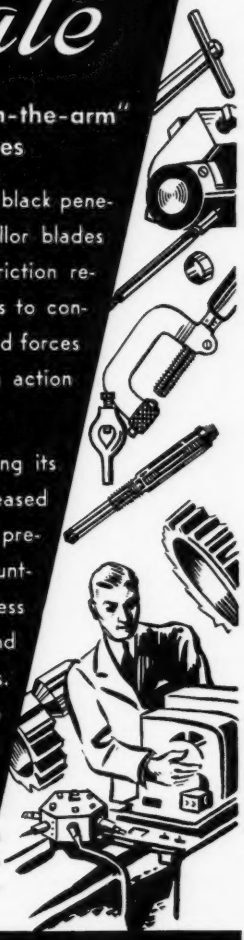

This attractive Black finish is replacing strategic metallic finishes on millions of non-defense items, too. Low in cost and simple to operate, the Pentrate Process can be quickly fitted into any production line. Full information on request.

**HEATBATH CORPORATION**
Springfield, Massachusetts

CANADIAN DISTRIBUTORS: WM. J. MICHAUD COMPANY, LTD., MONTREAL, QUEBEC, CANADA

lamp or for each pair of lamps. Special auxiliaries are available for the operation of fluorescent lamps on direct current. With them, however, the losses in the current limiting ballast are much greater than on A.C.

Filament Lamps—The amount of energy in the black light region produced by this type is small. Those such as the photoflood lamp, with filaments operating nearer to the melting point of tungsten and consequently with a much shorter expected life, produce the greatest quantities of active radiations. Since these sources are inefficient in the production of black light, it becomes necessary to use relatively high wattage sources. This necessitates the use of filters having high absorption in the visible portion of the spectrum as well as excellent heat resisting characteristics. However, filament lamps operate equally well on A.C. or D.C. and, therefore, are used where this consideration is of prime importance. If a low intensity portable source of black light is required, a flashlight can be equipped with the proper filter.

### Application

It is advisable to apply a white undercoat to surfaces to be coated with luminescent paints. Such undercoats should not contain metals or pigments which would be detrimental to the properties of the luminescent coating. It is advisable to apply two coats of luminescent coating to insure perfect coverage and maximum efficiency.

Since the Type B phosphorescent pigments and the fluorescent dyes are sensitive to moisture, it is necessary to apply a clear, pale finish coat which is transparent to ultra-violet and short wave-length visible light. It has been found that if a properly selected clear finish coat is used the efficiency of the luminous paint is not materially impaired. The clear finish also improves the washability of coating. The undercoat, luminescent paint and the clear finish can be applied by any of the well-known methods of application such as brush, spray, roller coating, dip, and so on.

### Methods of Test

The methods of test and evaluation of luminescent pigments are in need of standardization. The following specifications and tentative specifications describe test methods:

BS/ARP-18 — British Standard Specification for Fluorescent and Phosphorescent Paint (excluding Radioactive Materials) for A. R. P. purposes, July, 1940.

BS/ARP-32 — British Standard Specification for Illuminated and Nonilluminated A. R. P. Signs, British Standards, Institute, May, 1940.

Lacquers, Fluorescent—Instrument Marking. Air Corps Specification No. 14102, June 26, 1940.

Markers, Fluorescent—Instrument Identification and Range. Air Corps Specification No. 17012, July 19, 1940.

Paint, Luminous Nonreactive—Rock Island Arsenal. Tentative Specifications RIXS-122—Rev. 1, January 24, 1941.

Committee: Major Peter Rodyenko, Austin O. Allen, Eugene W. Beggs, Guido Henry, Samuel Hibben, Carlton Rose, Frederick C. Schmutz, R. A. Shive, George F. A. Stutz, Robert J. Moore, Ex-officio; Joseph J. Mattiello, Chairman.

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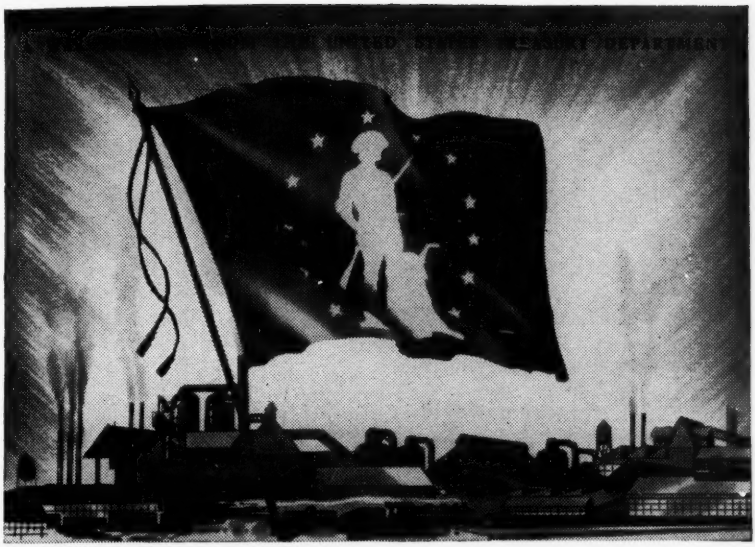
**Solving Metal Cleaning Problems.** A brief description of the methods used in solving industrial metal cleaning problems is contained in an illustrated leaflet issued by Detroit Rex Products Company, 13005 Hillview Ave., Detroit. Mich. This interesting leaflet shows the research, engineering, and manufacturing facilities for production of degreasers, washers, and chemical cleaners maintained by this organization.

A copy of this leaflet will be sent free upon request.



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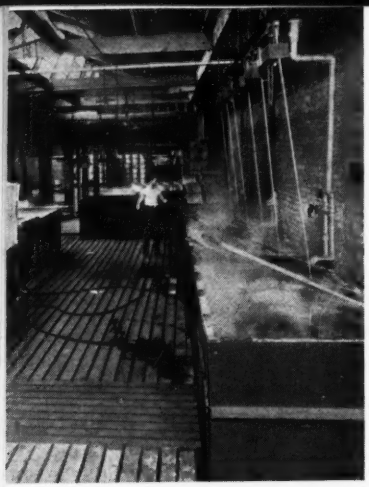


# News OF THE INDUSTRY

## Magnus Chemical Company Organizes Machine Division

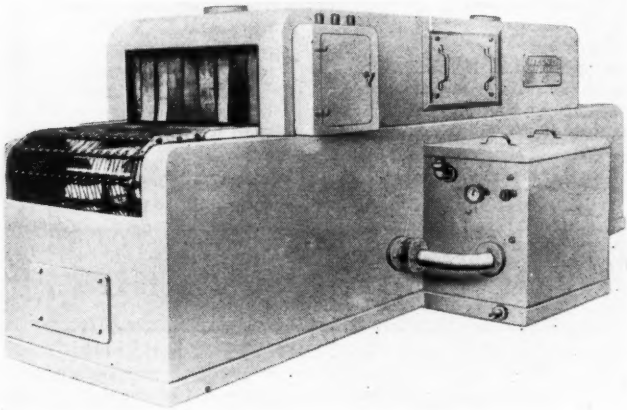
The organization of a Machine Division for the manufacture of mechanical metal washing machines, pickling machines, driers, ovens, and burnishing equipment has been announced by the Magnus Chemical Company, Inc., 208 South Ave., Garwood, N. J. The Magnus organization is well-known in the industrial field as a manufacturer of cleaning materials, industrial soaps, metallic soaps, sulfonated oils, emulsifying agents and metal working lubricants.

The new Machine Division will be under the direction of Mr. Marcel Zinty, former general manager of the Magnus European factory. Mr. Zinty is a mechanical engineer with a long and broad experience in the design, construction, and installation of all such types of machines and equipment. His experience embraces a long list of notable installations.

A staff of experienced draftsmen and metal fabricators have been assembled, and are now at work on the manufacture of a number of machines for important war plant installations. A complete engineering service is offered, covering everything from the original problem through finished installation to practical operation.

Considerable attention is being given to the development and manufacture of machines for use in connection with the Magnus Emulso-Dip and Emulso-Spray Processes. These represent special methods whereby metal parts can be cleaned effectively and at low cost. Such machines adequately meet all the requirements of high-speed production and the need for saving time and labor, as well as cost.

The Magnus sales organization, comprising 75 special industrial service representatives located from coast to coast, will serve as a distribution



A view showing a cleaning machine which comprises part of the regular production of the Magnus Chemical Company Machine Division

force, acquainting industrial manufacturers with facilities of the Machine Division on this equipment, its uses and applications.

## Arthur H. Losey Joins Hammond Machinery Builders Automatic Polishing and Buffing Division

Mr. Arthur H. Losey, well known polishing and buffing authority throughout the middle west, is a recent addition to the staff of the Automatic Polishing and Buffing Division of Hammond Machinery Builders, Inc., 1601 Douglas Ave., Kalamazoo, Michigan.

Arthur H. Losey

Mr. Losey for the past six years was associated with the J. C. Miller Co., Grand Rapids, as engineer and advisor on all polishing and buffing problems.

Having started as an apprentice in his father's job plating shop in Kansas City, Mo., Mr. Losey went to Michigan in 1928 to weld this early training into a chain of wide practical experiences. Starting to work with Michigan Bumpers, then called Wolverine Bumpers, he has been associated since with such well known manufacturers as Alloy Spring and Steel, Jackson; General Spring and Bumper, Chicago; Winters and Crampton, Grand Rapids; W. B. Jarvis Co., Grand Rapids; and National Brass, Grand Rapids.

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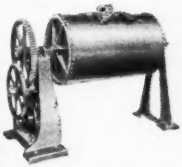
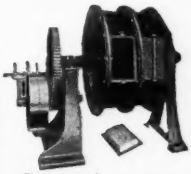


(Right) — Ruggedly constructed for heavy duty work such as removing fins and flanges from castings. Available in varied sizes with tight and loose pulleys or motor drive as shown.

**COMPARTMENT BURNISHING BARREL.**



(Right) — Performs up to three jobs at once, speeding production. Exceptionally strong and durable. Large door opening facilities loading and unloading. Belt or motor driven.

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# Hanson-Van Winkle-Munning Improves Plating Laboratory Facilities

In order to provide facilities for the greatly increased volume of research and experimental work necessary under present conditions, the plating laboratories of the Hanson-Van Winkle-Munning Co., Matawan, N. J., have been completely reconditioned and expanded.

The external appearance of the laboratory has been improved by joining two buildings and constructing a new, decorative entrance. All laboratory rooms are now accessible from a central hallway. Three new offices have been constructed, as well as a library. Stairways now connect the laboratory to the main office so that it is not necessary for visitors or persons within the plant to go outdoors.

A new solution preparation room has been provided for analytical solutions for the company's use, and also for those which are sold to customers using the Hanson - Van Winkle - Munning "Simple Methods of Analysis." Between the solution preparation room and the analytical laboratory, an experimental electroplating room has been built and a modern and complete electroplating control board installed. This board is used for making bent cathode tests on plating solutions, for experimental electroplating tests, and for the examination of raw materials and supplies used in electroplating processes.

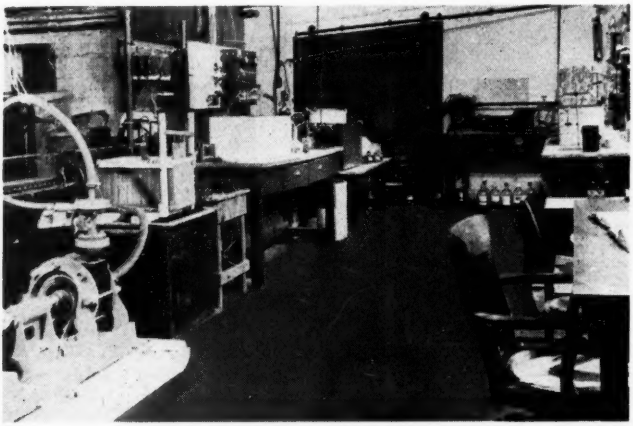
This control board has six places for work with coded plugs and jacks to facilitate rapid setting up and tearing down of experimental plating units. The plug-in feature is a valuable aid to ease in handling, setting up and taking down experimental equipment.

The board is divided into two parts with three places in each part. Each set of three places is served by one ammeter and one voltmeter, with selector switches provided to enable the operator to obtain the desired voltage and amperage at each place. A field rheostat is available for the control of the voltage at the generator. In addition, carbon pile rheostats have been placed in series with each set of outlets for close control of the current.

One side of the board with its three places is used for work at room temperature and low current density. The other side is used for the higher current density range, at higher temperatures, thermostatically controlled, in a stainless steel tank.

Special glass, laboratory size, plating bath containers are provided of shape and proportions to simulate commercial conditions, with the proper relationship of anode-to-cathode area. A built-in timing device with a pilot light and a buzzer are included for timed experiments. The thermostatic bath is electrically heated and agitated.

Compressed air is available at the panel, fitted with air filter and air regulator. Where mechanical agitation is required, as for example in cyanide solutions, air and electric motors are used, with proper speed control. Sources of current are a generator and batteries. Either source can be thrown in by a double-throw switch. Another switch is provided for charging the battery by the generator.



Research facilities have been expanded by providing more space and also by installing new equipment. The instrument room is used for both research work and routine control. Besides the metallographic equipment, such as specimen mounting presses,

Fig. 1—General view of Hanson - Van Winkle - Munning plating laboratory

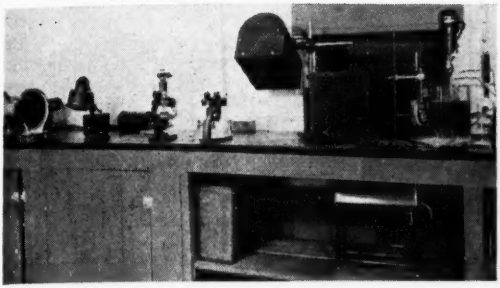


Fig. 2 — Electroplating Control Board in Hanson-Van Winkle-Munning laboratory for experimental electroplating tests, examinations of raw materials and supplies in electroplating processes

microscopes, and other physical testing equipment, the installation includes an optical bench, special photographic equipment and a stereoscope for microscopic examinations. A dark room is available for processing plates and films; adjoining the instrument room, a research laboratory has been provided for the study of alkalies, inhibitors, fluxes, and related products.

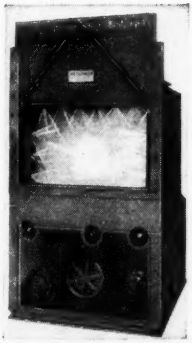
The polishing room has been rebuilt and new equipment installed, including a special heavy duty variable speed Hanson-Van Winkle-Munning Type MI lathe and other accessory equipment. A small bench lathe is used for preparing specimens and for polishing of small articles. Adjoining the polishing room is the testing room and on the other side of the testing room is spray equipment for lacquering samples. A new exhaust system has been installed.

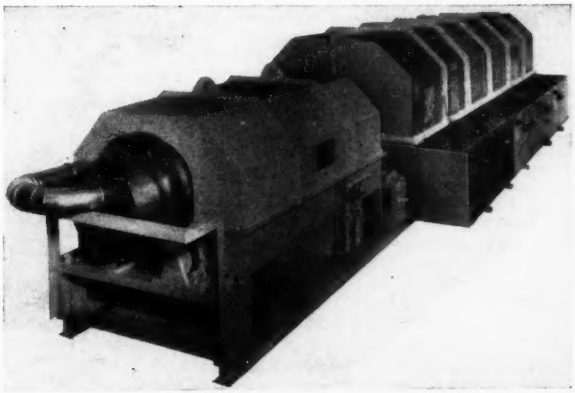
A large research room where semi-commercial plating tests can be made has been provided on the second floor. New pumps, tanks, heating devices, and controls have been installed. All of these facilities are at the service of customers of the Hanson-Van Winkle-Munning Company.

## War Production Conference

A war production conference on cleaning and related manufacturing opera-


***Here's the answer to your difficult Cleaning Problems***





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tions is now being held concurrently by the entire field, mechanical engineering, chemical research and general headquarters staffs of Oakite Products, Inc., in New York, Chicago, and Los Angeles.

Sessions of the three-day program of each division conference are being devoted to the discussion of improved ways to speed-up output in connection with the production of airplanes and motors, shells, cartridge cases, guns, tanks, bombs, fire-control instruments, communication equipment, helmets and a wide range of ordnance material and war supplies.

Among the specific operations being covered are new materials for cleaning parts by tank and automatic washing machine methods before inspection, assembly and finishing operations; new methods for preparing aluminum alloy aircraft parts, structures and assemblies for resistance spot welding and anodizing; removing quenching and tempering oils from heat treated rifle, machine gun and small cannon parts; and cleaning polished steel, buffed brass, zinc and other metals and alloys. Such related production operations as cutting, grinding, drawing and stamping are also listed on the discussion program of each conference.

In addition to these operations, each conference will review various other types of essential cleaning from production, maintenance and sanitation standpoints that are predominant in the particular areas in which each Oakite field service division operates.

According to J. A. Carter, Assistant-to-the-President, this Oakite conference provides a means of quickly exchanging information on essential war work that is made readily available through the medium of the company's nation-wide field service staff to plants now working on Government Orders or currently converting to ordnance production.

## A. H. Clem Transferred to Pennsylvania Salt Executive Offices

A. H. Clem, for the past three years district sales-service representative of the Penn Salt Cleaner Division in the Detroit area, has been transferred to the executive offices of the Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa. He will co-ordinate the activities of the company's Industrial Cleaner Division, recently enlarged to handle the increasing metal cleaning problems of war goods manufacturers. Mr. Clem graduated from Pennsylvania State College

A. H. Clem

with the degree of Bachelor of Science in Chemical Engineering. He went to the Detroit territory after a year in the Company's Research Department.

## Republic Filters, Inc.

Republic Filters, Inc., is the new name adopted by American Seitz Filter Corporation to make it clearly evident that the entire personnel of this company and all its efforts are wholly devoted to the patriotic service of the United States. The factory and executive offices of Republic Filters, Inc., are located at Paterson, N. J. An eastern sales office is maintained at 480 Lexington Ave., New York City.

## Udylite Corporation in New Location in New York

According to a recent announcement, the Udylite Corporation office and warehouse for the Eastern District has been moved from 60 E. 42nd St., to 11-16 44th Drive, Long Island City, N. Y. A complete line of electroplating and polishing supplies will be maintained for the convenience of Udylite customers.

## Comprehensive Safety Program Helps Speed War Production

The adoption of a comprehensive safety program, states American Op-

**To help speed up war production by preventing industrial accidents, the American Optical Company, Southbridge, Mass., is making available a free safety advisory service for industrial plants. Shown at the right are some of the services that assist in making safety programs effective.**

•

tical Company, Southbridge, Mass., is one method of helping speed up war production. According to recent statistics, industrial accidents last year advanced between 10 and 15 per cent over the previous year, hence the necessity of taking adequate preventive steps to conserve man power needed for production.

Accordingly, American Optical Company is making available a free safety advisory service for industrial plants so that plant managers and safety engineers can take advantage of the optical concern's many years of experience in the safety field.

This safety service includes: First, a survey of industrial plants by a trained American Optical industrial representative to locate those hazardous jobs which require eye-protection equipment, respirators, or safety garments; then, a definite program to prevent accidents and a plan to enlist the cooperation of foremen and workers; next, personal detailed check-ups of the entire safety program to insure best results; and finally, posters, constructive messages on eye protection, and other literature that will keep everyone from unskilled labor to plant executive mindful of the safety work.

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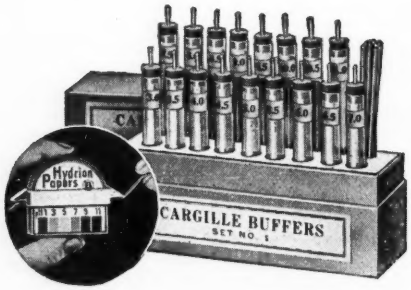
# New PLANT EQUIPMENT AND Materials

## Cargille Buffer Set No. 1

pH tests for degree of acidity or alkalinity of solutions can now be made by a very simple technique using the new Cargille Buffer Set No. 1 with Hydrion Wide-Range pH Test Paper which has been placed on the market by R. P. Cargille, 118 Liberty St., New York City.

Solutions of known pH, made by dissolving the tablets in this set, are applied to the test paper to bring out on the paper the color for any half unit from pH 3 to pH 11. The colors are used for reference to judge the pH of the sample being tested; comparisons made with these reference colors are more accurate than those made with color charts. Readings can be made to one-half pH unit. Cargille Buffer Set No. 1 is designed for control tests in the plant by unskilled workmen; also for quick preliminary tests in laboratories where more elaborate pH apparatus is available.




Cargille Buffer Set No. 1

## Wrinlin 68

Due to the shortage of China Wood Oil and curtailment of varnishes and enamels, New Wrinkle, Inc., 314 W. First St., Dayton, Ohio, has developed a substitute hard drying, wrinkling material to be known as Wrinlin 68. This material is said to be formulated from domestic oils and is offered to the manufacturing licensees of New Wrinkle, Inc., for their use in the production of Wrinkle finishes.

Wrinklin 68 is said to serve two wartime purposes: It releases thousands of gallons of China Wood Oil to other uses and it alleviates a threatened reduction in the allotment of China Wood Oil set aside for the production of Wrinkle finishes.

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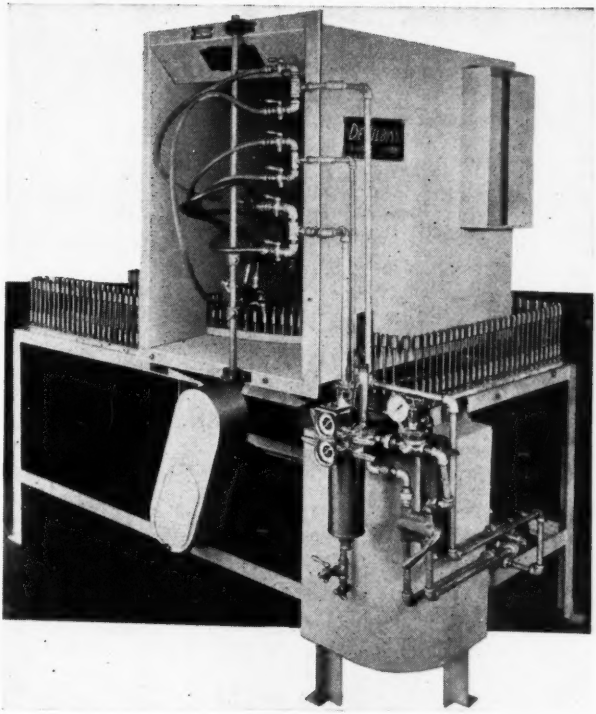
## DeVilbiss Automatic Painting Machine for Small Parts

A machine for automatically painting small shells and shell parts has been developed by The DeVilbiss Co., 300 Phillips Ave., Toledo, Ohio. The machine shown in the illustration is designed to coat the exterior of 20 mm. shells at a rate of 2,000 per hour.

The machine is built around a "chain-on-edge" variable speed conveyor which is of sufficient length to allow for a 10-minute drying time at a production rate of 1,000 shells per hour or five-minute drying time at a production rate of 2,000 shells per hour. Spindles for supporting the shells are of the removable type and are equipped with flat surface pulleys for rotation inside the spray booth. Spindle rotation is obtained by means of a separate variable speed

DeVilbiss Automatic Painting Machine for Small Shells



drive. Work holders for the shells are mounted on the spindles.

Spray guns are the automatic air piston type with adjustable cam-operated spray control. The 10-gallon pressure feed paint tank is equipped with air motor driven agitator. Spray booth, exhaust fan, air transformer and the necessary air and fluid hose, control valves, fittings, and connections complete the machine.

Machines of this type are now in use in the painting of the several classifications of 20 mm. shells, 20 mm. practice shot, and 20 mm. fuses and fuse bodies.

## Pulmosan Magout Powder

A powder for quickly extinguishing magnesium fires, to be known as Magout Powder, has been developed by the Pulmosan Safety Equipment Co., 176 Johnson St., Brooklyn, N. Y. Magout is a non-absorbent finely pulverized dry powder which is said to be safe to handle and easy to use, and is designed to instantly smother fires caused by magnesium shavings in machine shops or by magnesium incendiary bombs.

Magout Powder is available in either bulk quantities or in handy instant-action tubes for sprinkling on fires. These cardboard tubes are spiral shaped for convenience in handling, have metallic ends, and are lined with paraffin.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•AUTOMATIC POLISHING & BUFFING MACHINES

Packer-Matic

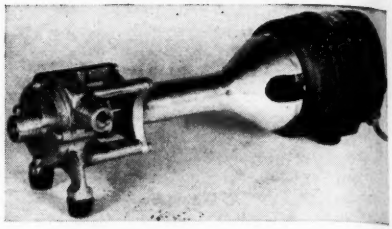
THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

## Eastern Model EH Hot Liquid Pump

Designated as the Model EH, a centrifugal type hot liquid pump of compact construction has been introduced by the Eastern Engineering Co., 40 Fox St., New Haven, Conn. The pump is designed for use in industrial and pilot plants, laboratory and experimental applications where thin liquids at temperatures up to 500 deg. F. are to be handled.

Model EH pump is 12 in. long, 4 in. wide, and 4½ in. high and weighs 7 lbs. The unit is powered by means of a 1/20 h.p. universal fan-cooled motor designed for use on 115 volt alternating or direct current.

The stuffing box of the pump is accurately adjustable by means of an easily accessible adjustment ring. The

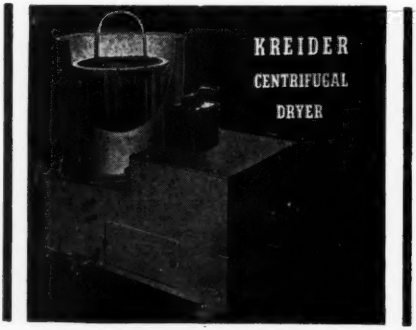


Eastern Model EH Hot Liquid Pump

motor and pumping unit are coupled through a 5-in. heat radiating tube containing a shaft supported by outboard ball bearings.

The Eastern Model EH Hot Liquid Pump has a maximum pressure of 21 lb. per square inch and maximum volume of 7½ gallons per minute. The pump is manufactured in stainless steel, Monel metal, chromium plated bronze, Hastelloy "C," and other alloys.


**Speed Your Drying! . . . Use a**




**FOR FASTER, LOWER COST DRYING OF PLATED PARTS**

**A high speed, one-man drying outfit that will speed production and at the same time improve quality. May also be used for lacquering small parts. Sturdy all steel, electric welded construction. Fool-proof controls include foot brake and reversing drum. V-belt drive; anti-friction bearings. Auxiliary heating unit available.**

*Write for complete information and prices.*

**DELLINGER MFG. CO., 729 N. Prince St., Lancaster, Pa.**


## Yale "Timber-Lock" Skid Platform

Designed to conserve steel for defense purposes, a uniquely designed skid platform made of specially selected tough oak wood and said to be so constructed as to practically defy breakage is announced by The Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia, Pa. According to the manufacturer, a large part of the strength of the platform, which is known as the "Timber-Lock," is traceable to an interlocking "wood-weld" process by means of which supporting leg runners and deck boards are tied into one virtually inseparable unit.

In constructing the platform, two deep grooves are cut along the entire length of the platform deck boards, into each of which a hard oak beam is tightly fitted, thus interlocking platform and beams in a vise-like grip that is said to completely eliminate rocking, shaking, and other forms of instability. To further ensure this one-piece rigidity, beams and deck are bound together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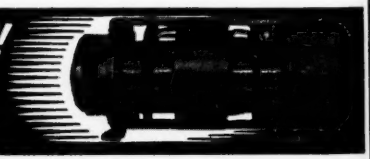


Yale "Timber-Lock" Skid Platform

with specially cement coated spiraled Helical nails, binding platform and beams at double-rowed 1-inch alternate intervals along the entire platform length.

Legs are of high grade formed steel bars, joined to leg beams by heavy forged steel bolts. Washers on the top and bottom of the bolts assure rigid clamping. In addition, the large diameter steel washer under leg bolt heads provides wide bearing point and ensures leg stability.

The Yale Timber-Lock Skid Platform is available in all standard widths and lengths, plain or armored end, also vertical or standard leg design; four or six leg construction.

## Hyspar Metal Lead Primer

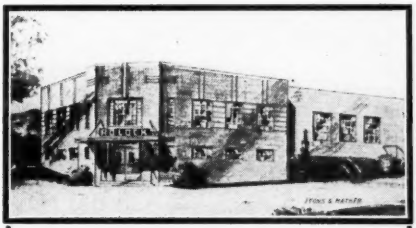
As an alternative to aluminum paint priming, The Midland Paint & Varnish Company, 9115 Reno, Cleveland, Ohio, offers manufacturers a metal lead primer which because of its metallic, non-rusting components is claimed to be equal in its protective value to that of a good grade of aluminum paint. According to the manufacturer, Hyspar Metal Lead Primer is rust inhibiting, preventing rust from working from the inside of the material through the finishing coat. It may be brushed, sprayed, or dipped and dries hard in four to five hours.

Since Hyspar Metal Lead Primer is neutral gray in color, it will not bleed through the finishing coat, or need more than the usual finishing coat required when aluminum was used. The manufacturer reports that this paint was originally prepared several years ago to meet the special problems of painted outdoor displays and large neon spectaculars which, being subject to all kinds of weather, required a paint of unusual protective ability with high elasticity as a feature. It is said that this paint will not crack nor flake off and holds tight to metal under rapid climatic changes, and is also highly resistant to the salt impregnated air of the seaboards.

This paint can be obtained from the manufacturer in two forms, in large quantities already mixed for application or in separator cans with the metal past separate from the liquid, to be mixed in the same fashion previously required for good aluminum finish.

## L & R Precision Cleaning Unit

A cleaning unit for the precision cleaning of delicate metal parts has been placed on the market by L & R Manufacturing Company, 54 Clinton St., Newark, N. J. The unit consists pri-

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marily of three jars of 1½ gallon capacity each and a revolving agitating unit.

In operation, the parts to be cleaned are placed in a work basket and the loaded basket is snapped into position on the motor shaft. The center bar on which the motor is mounted properly positions the basket over each solution jar and the drying chamber.

The basket is first lowered into the cleaning solution jar which contains L & R Power Nofome, a non-foaming cleaner. A rheostat on the base of the machine is used to regulate the motor speed. The special gear reduction Dumore motor drives the basket through a 14 to 1 ratio allowing plenty of extra power.

Monel baffles within the jars together with a unique design of the carrying shaft assure thorough agitation of the solutions. After running the Power Nofome solution the motor is cut and the basket is raised in the jar above the liquid level and again rotated to throw off excess solution. The jars are of sufficient height to receive the fluid thus thrown off. These operations are then repeated in the second and third jars both of which contain the L & R Rinsing Solution.

The motor carrier is then revolved to the fourth position which places the work basket over the drying chamber. This contains a separate motor and fan in conjunction with a vitreous heater unit. The heater switch should be turned on at the start of each cleaning job to insure maximum heat for the last operation. The motor carrier lid rests on a metal upright at the side of the heater chamber which permits the basket to fit just over the drying units. This is the final step in the cleaning and drying cycle.

L & R Precision Cleaning Unit

About two to three minutes are required for each phase of the cycle depending on the type of instruments cleaned and the condition of the parts. The operator, after once using the machine, can thereafter judge the time necessary for each step. The work basket is made entirely of Monel and Monel mesh. It is 5½ in. inside diameter and 3⅜ in. deep.

The jars are of 1½ gallon capacity, 7 in. inside and 9 in. deep. Jar covers are made of aluminum with felt gaskets. The motor carrier plate is gasketed with leather to prevent possible damage to the jars when lowering the basket. The base of the machine is a heavy aluminum casting.

The net weight of the machine with solutions is 41½ lbs. It occupies a space 17¼ in. by 16½ in. and is 23 in. high over-all. Each machine is furnished with one gallon of Power Nofome Cleaning Solution and two gallons of Instrument Rinsing Solution. The ma-

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chine is shipped completely assembled for use. Solutions for this machine are shipped, packed in one gallon containers.

## American R9100-T Respiratory Protector

American Optical Company, Southbridge, Mass., has announced a new respirator for protection against toxic dusts. Representing an entirely new design in toxic dust respirators, this

American R9100-T Respiratory Protector

new American R9100-T Respiratory Protector is light in weight and gives full vision, while the entire face piece is itself a filter and compresses maximum protection area into minimum space.

The closely felted, laboratory-tested filter has been approved by the U. S. Bureau of Mines for protection against the inhalation of toxic or poisonous dusts (dispersoids or particulate matter formed by the disintegration of solid materials by such processes as crushing, grinding, or abrading) as lead, cadmium, arsenic, chromium, manganese, selenium, vanadium and their compounds.

The easily adjusted face piece with its leak-sealing cantilever edges of pure, pliable rubber gives real face-fitting comfort. The simple, non-reversing exhalation valve gives positive protection. The double headband of solid, sanitary rubber holds the respirator, which weighs only one and a half ounces, in place without noticeable tension and will not force mask-edges into face.

In design, this new R9100-T Respirator resembles the recent American R9100 Respirator for protection against Type A dusts, which is said to have been widely approved by safety engineers and industrial workers.

## Hammond Independent Dust Collectors

A line of self-contained dust collector units available in three sizes is announced by Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo, Mich. The three sizes, which are designated as the Models 30, 40, and 50, are of a compact functional


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Hammond Independent Dust Collector

design, thus requiring a minimum of floor space.

Filtering capacities range from 275 to 1,100 c.f.m. with air velocities in inlet ducts up to 6,000 feet per minute. Two standard inlets are provided on each unit—3 inches in diameter on Model 30, 4 inches in diameter on Model 40, and 5 inches in diameter on Model 50. Inlets in special locations and of special sizes can be furnished on all models if desired.

The motor capacity is ¼ h.p. for Model 30, ½ h.p. for Model 40, and 1 h.p. for Model 50. The motor, fan, fan housing, and electrical connections are all fitted in a removable plate, thereby making all moving parts readily accessible for inspection.

The filters are of a "throw away" type made of glass fiber. Three filters are provided in each unit through which the air passes. The filters are easily removed for cleaning or replacement through an opening in the back of each unit. Models 40 and 50 are supplied with a filter shaking mechanism by means of which a large part of the dirt can be shaken from the filters into the bottom pan.

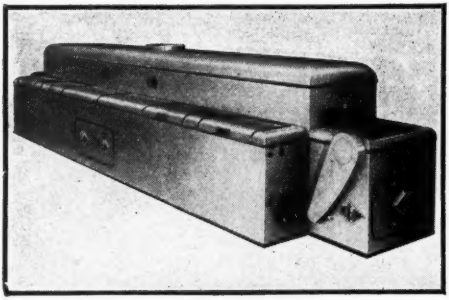
During the operation of the Hammond Independent Dust Collector, the air enters the inlets and passes down to the bottom of the unit over a system of baffle plates which straighten out the air currents and cause the larger particles to drop immediately into the dust pan. In this manner, only the finer particles reach the filters, thereby materially reducing the filter load.

Hammond Independent Dust Collectors are said to have a multitude of applications in connection with various types of grinders in plants which do not have central exhaust systems and in plants whose central exhaust system is not available to numerous isolated grinders.

## Smooth-On No. 7B Quick Patch Cement

A cement for use in the quick patching of cracks, ruts, and shallow holes in concrete floors, to be known as Smooth-On No. 7B Quick Patch Cement, has been placed on the market by Smooth-On Mfg. Co., Dept. 437, 570 Communipaw Ave., Jersey City, N. J. The material is said to harden quickly and adhere firmly to the surfaces to which it is applied.

According to the manufacturer, Smooth-On No. 7B Quick Patch Cement has an iron base, thereby making it extremely wear-resistant as well as dustproof, oilproof, and waterproof. Patches of the material are said to harden overnight, permitting full traffic the following morning, and become stronger with age.

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**Industrial Washing Machines**

Streamlined design. Hidden motors, pumps and pipes are easily assembled. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Monorail, Belt or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

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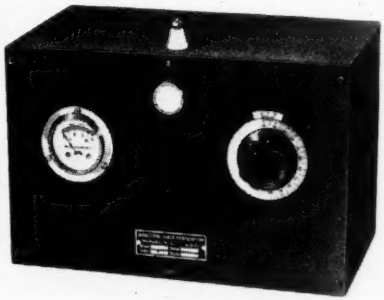
## Industrial Robot Raid Warden

A Robot Raid Warden for use in factories where advance warning of an alert is necessary to prepare for blackout or other emergencies is now being manufactured by the Industrial Timer Corporation, 115 Edison Pl., Newark, New Jersey.

This set is designed to control lighting circuits or give an audible alarm during an actual air raid warning. The device is tuned to the carrier signal of key radio stations. These stations, cooperating with the armed forces, are on the air 24 hours each day. In the event of a signal from the Interceptor Command for the station to cease broadcasting, the Robot Raid Warden is automatically set in action.



Industrial Robot Raid Warden

Incorporated in the Robot is a pilot light which is located on front panel of the unit. This light goes on as soon as the unit is plugged in to the power source and indicates that the Robot itself is operating efficiently. In the event of an unusual mechanical or electrical disturbance within the Robot, the pilot light is automatically extinguished.

The Robot is tuned to the key station continuously. When the broadcasting station's carrier goes off the air, the Robot synchronous motor driven time delay unit starts operating. When the carrier has been off the air for two minutes a relay is actuated operating a set of single pole double throw contacts capable of controlling loads up to 10 amps., which control the previously determined alarm or lighting circuits.

## Porcelstix

A material to be known as "Porcelstix" for repairing chipping porcelain enameled products has been placed on the market by Finishine Laboratories, Inc., 627 Tallman St., Syracuse, N. Y. The material is available in white, black, blue, light green, medium green, dark green, ivory, red, yellow, orange, brown, buff, and gray.

Porcelstix is said to be easy to use. It maintains a permanent color and is also said to be waterproof.

## A-F Product Washing Machine

The slow, time-consuming, costly method of "dunking" shells in tanks of boiling solution by means of racks, lift-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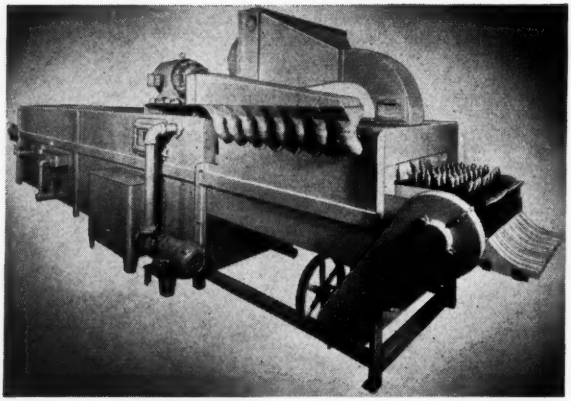

Alvey-Ferguson Product Washing Machine

ing the racks, lowering them into rinse tanks, then placing them over a drain section and blowing off the excess moisture by means of compressed air has, it is claimed, now been made obsolete by the A-F Product Washing Machine shown herewith, product of The Alvey-Ferguson Co., 777-E Disney St., Cincinnati, Ohio.

Especially designed to remove grease and chips from and dry 20, 37, or 40 mm. shells, this machine is an integral part of the production line. A feature of the unit is the automatic ejection of shells.

## "Speed-Patch" Floor Repairing and Resurfacing Material

Known as "Speed-Patch," a material for use in repairing holes, spalls, and worn expansion joints in industrial floors as well as for resurfacing floors is now being marketed by the Rock-Tred Corp., Dept. N., 605 W. Washington Blvd., Chicago, Illinois.

Speed-Patch is a ready-mixed cold plastic material which may be used as taken from the package. According to the manufacturer, the material may be applied during working hours without interrupting plant operations and is benefited rather than injured by truck traffic while applying. For complete resurfacing, Speed-Patch is simply dumped on the floor and rolled out to a smooth, ready-to-use floor.

Speed-Patch is said to withstand any weight load and to provide a safe, low traction, permanent floor repair. In addition, the material is said to have a great resistance to oils and greases.

## Photoswitch Electronic Level Control Series P16

A liquid level control to be known as Photoswitch Level Control Series P16 has been placed on the market by Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass. This liquid level control provides on and off valve or pump control of any liquid. Complete equipment is available for single level indication and control, on and off pump-up and pump-down control at two levels,

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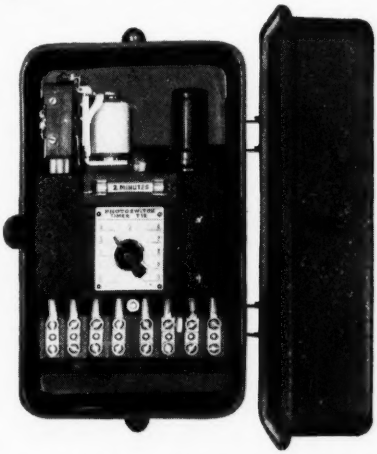
boiler feedwater control and low level safeguards. Probe fittings have been designed for high and low pressure and



Photoswitch Electronic Level Control Series P16

temperature requirements as well as for sanitary installations.

Photoswitch probes or electrodes are attached to the tank at levels representing the low point where pumping starts and the high level where pumping stops. These probes are wired to the Photoswitch Level Control. When the liquid level falls below the lower probe, the level control starts the pump in operation and the tank fills.

When the level rises to the upper probe, the fluid itself acts as the conductor of the small amount of current required for the operation of level control which stops the pump. When used with non-conductive fluids, the probe circuit carries only milliamperes of current and low voltage.

Since Photoswitch Electronic Level Controls Series P16 do not involve mechanical float or pressure switches, they are said to be easily installed and free from maintenance requirements.

## "Lixol"

A solvent emulsion-type metal cleaner to be known as "Lixol" has been placed on the market by Cowles Detergent Company, 7016 Euclid Avenue, Cleveland, Ohio. This cleaner is said to be suitable for use on all kinds of metal. Metals cleaned in this material are coated with an invisible oil film which is said to be ideal for painting or shop storage.

Lixol produces physically clean surfaces and, according to the manufacturer, can be used alone or diluted with water or kerosene.

## Leiman Shell Sandblast Machine

An automatic, compact sandblast machine designed to process a large quantity of work in a minimum of time has been developed by Leiman Bros., Inc., 111-4 Christie St., Newark, N. J. It is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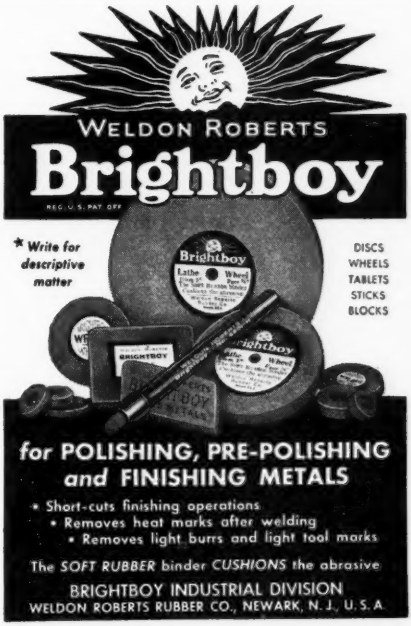
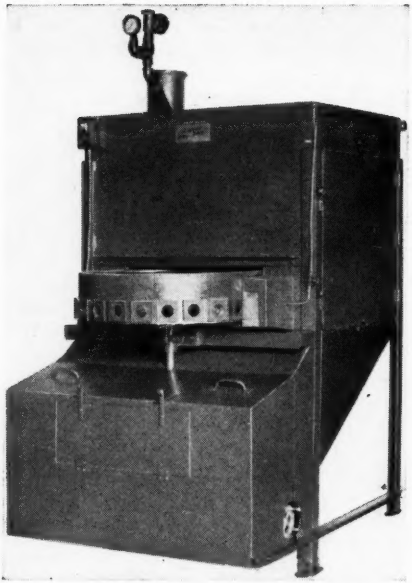




Leiman Shell Sandblast Machine

said to be especially adapted for the sandblast cleaning of shells.

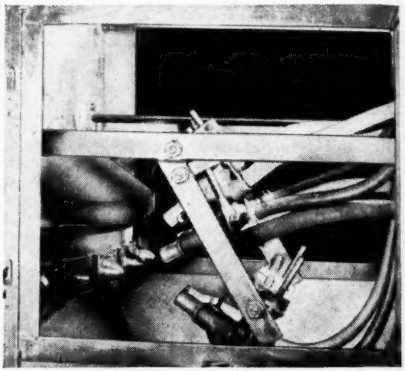
The machine is equipped with a rotary table on which the work is held for processing. The table extends into the interior of the machine so that the parts on one side of the table can be processed while the other side, being outside the machine, is being reloaded. Power to drive the table is supplied by a motor the speed of which can easily and quickly be changed to suit the work.

The sand is directed at the work through a number of nozzles which may be adjusted to any desired position. The actual sandblast operation is, of course, carried on inside the cabinet so that no abrasive or dust can get outside to affect the operator or adjacent equipment.

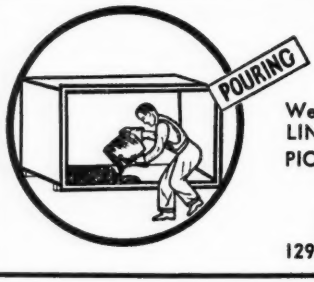
A slotted multiple rubber curtain prevents any of the abrasive from being blown out while at the same time a suction blower—which may be in another location—draws the dust from the interior of the machine, thus preventing any tendency of the dust to blow out.

The machine may be equipped with two or more nozzles, which may be set at the required angles. The nozzles are of the suction type, and draw the sand or abrasive from a receptacle in the bottom of the machine. After the sand has been blown through the nozzles, it drops to the bottom of the machine to be drawn up by suction and used over again.

Although designed especially for the cleaning of shells, the machine can be used for a wide variety of work.



View Showing Interior of Leiman Shell Sandblast Machine and Arrangement of Nozzles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## Whiting Hydro-Clone Dust and Fume Suppressors

Whiting Corporation, Harvey, Ill., has announced the acquisition of the Hydro-Clone line of dust and fume suppression equipment for every type of foundry and industrial application. According to the manufacturer, the Hydro-Clone units effectively suppress dusts and fumes by a simple process of disintegration in which dust and fume laden air mixed with water is subjected to high velocity impact, and the air effectively cleaned without hazard of fire or explosion.

Hydro-Clone units in eight different designs, including grinding and polishing booths, and spray cleaning booths, are individually engineered for every specific application. All employ the disintegrating principle and have no moving parts.

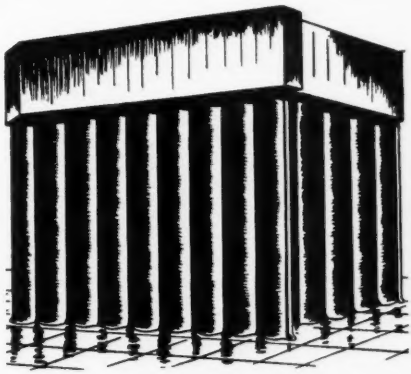
## Watson-Standard Conversion Lacquers

The Watson-Standard Company, 255 Galveston St., Pittsburgh, Pa., announces the development of a series of lacquers especially adapted to the conversion from tin or terne plate to black plate. These new lacquers developed over a period of several months have unusual properties of adhesion to the black plate and prevent under film corrosion, according to the manufacturer. The new series includes lacquers developed to withstand processing for home canning. One of the outstanding features of the lacquers is the fact that they can be made in metallic colors, thus solving an important problem of decoration.

## New Castle Folding Fabric Blackout Partition

A folding fabric blackout partition for building entrances has been developed by New Castle Products, New Castle, Ind. Designed to conform to blackout standards and at the same time permit easy access to and exit from lighted buildings, the partition works on an accordion-like principle, assuring unusual flexibility. The partition derives its accordion-like operation from a specially designed hinge lock self-spacing hinge plate at the top.

Folding on itself, the partition has a roller assembly traveling on an overhead track. A vertical pipe, concealed in a loosely fitted front hem, is connected to the lead trolley and extends



New Castle Folding Fabric Blackout Partition

to approximately 6 inches from the floor. This pipe provides rigidity to the front of the partition and serves as a standard.

The flameproof blackout fabric is at-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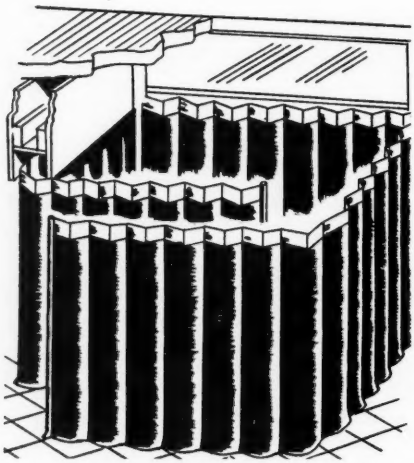


View of Blackout Partition from Above, Showing Masking Arrangement

tached with grommets at the top and to one side of the hinged plates. The height of the fabric is 2 inches greater than the height of the room, dragging the floor and assuring adequate coverage. Both sides of the hinge plates are covered with the same fabric. Valances are provided for each side to ensure a perfect light lock.

The New Castle Folding Fabric Blackout Partition is attached to the wall with screws or nails by means of a covered wooden cleat extending the full length of the partition. When not in use, the partition can be folded to the wall, thereby consuming a minimum of space.


**1-9-4-?**

Some year the war will end.
Swords will be beaten back into plowshares, and golf clubs and refrigerators.
There will be a swing back into the things we buy because we like them and not because they are a grim necessity.
You are planning these things now, or should be.
Let us plan with you toward the finish for 194?, whenever it is.
We welcome any call for co-operation on long-range planning for the finish of the future.
Meantime, for 1942 and as far as we can see, we shall do our utmost to supply our customers with the best available materials and service permitted by wartime conditions.

**The Varnish Products Co.**
**5208 Harvard Ave. Cleveland, Ohio**


## "duMag" Fire-Extinguishing Compound

A dry fire-extinguishing compound designed specifically for extinguishing magnesium and incendiary bomb fires, to be known as "duMag," has been placed on the market by DuGas Engineering Corp., Marinette, Wis. A minimum of the compound is said to be required in extinguishing fires. In addition, the compound is said to be moisture-resistant, remain free-flowing even when stored for long periods, is non-abrasive, and will not react with burning magnesium.

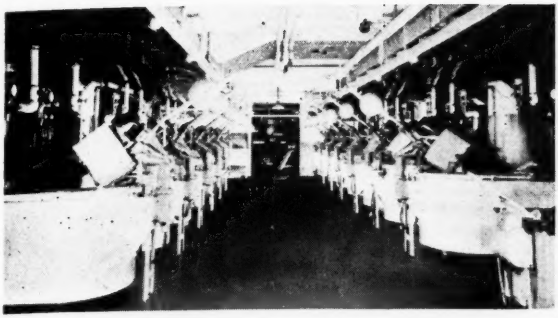
DuMag powder is a blend of various chemicals in correct proportions to give the desired characteristics. It can be applied directly from container to the fire, or to the burning bomb with scoop, shovel, extinguisher, or other mechanical means. According to the manufacturer, duMag has been tested and approved by the Factory Mutual Laboratories for fires in magnesium alloys.

DuMag Fire-Extinguishing Compound is available in 45-lb. pails and 12-lb. tubular containers. The quantity in the tube is said to have been proved by actual test to be amply sufficient to extinguish the common 2-lb. magnesium-thermit type incendiary bomb.

## Westinghouse Watthour Meter Controls Electroplating Current

A new use for the ordinary watthour meter is to provide an accurate and refined control of the current used in electroplating permanent magnets at the Westinghouse Newark works.

The watthour meter is connected to the alternating current side of a rectifier such as used to supply direct current for electroplating. The register for the watthour meter includes a switch device adapted for closure after



A copper plating thickness is controlled by using watthour meters to control the current to these electroplating tanks.

a predetermined amount of energy has passed through the meter. This switch operates a circuit breaker to open the energizing current circuit and thereby interrupts the plating or charging circuit when the desired plating thickness is attained.

Since the voltage of the alternating current is substantially constant, the number of ampere hours of the output rectifier will be proportional to the energy consumed, and no special ampere hour meter or timing device is necessary to obtain accurate electroplating results.

The watthour meter may be placed on a switchboard some distance away from the plating tank whereas in the case of the ampere hour switch it is necessary to place the shunt near the plating tank in the heavy output lead. This means besides taking up valuable space used by the shunt, extra precaution must be taken to protect it and the leads from the plating solution and fumes from the parts being plated.

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## Wilbur & Williams Shatter-Resistant Coating for Glass

The present intense interest in air raid precautions emphasizes a long-existent need of a transparent material for application on glass to prevent shattering. This need has been met by the new transparent coating which has been developed and is being manufactured by the Wilbur & Williams Company, Park Square Bldg., Boston, Mass. This new material comes in liquid form, ready for use. It can be applied by spraying or brushing.

This coating is said to pass sunlight with very little absorption and therefore weathers very well without discoloration. It dries very quickly, forming a strong, tough film having a tensile strength of from 3,000 to 5,000 lbs. per square inch. Elongation is over 20 per cent, permitting considerable movement of the glass without rupture of the film.

The actual melting point is over 200 deg. C. and excellent protection is given at temperatures up to 212 deg. F. Only very slight discoloration will be found after prolonged exposure. While not intended for long service on the exterior where exposed to weather, this shatter-resistant coating should be very useful in any period of active bombing; and, on the interior, should give protection for an indefinite period. Wilbur & Williams Shatter-Resistant Coating for glass fills an immediate need in office buildings and factories. Factories which require window-glass paint in


**BLACK-MAGIC**

**"A LOW TEMPERATURE BLACKING SALT"**

***The one-bath process***

**A Government approved process for blacking steel and iron.**

**A satisfactory substitute for many plating finishes.**

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**Other Black-Magic processes for Brass, Copper, and Zinc die castings.**

**The Mitchell-Bradford Chemical Co.**

**BRIDGEPORT, CONN.**

normal times for glare reduction may now obtain a colored coating which combines glare reduction with resistance to shattering.

## "A" Lustral Enamel

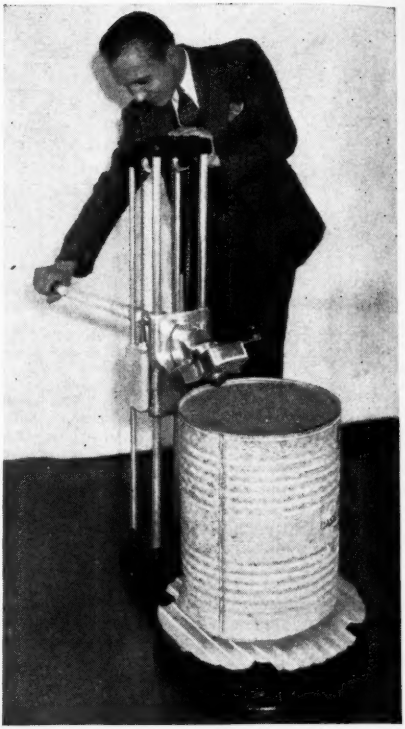
"A" Lustral Enamel has been reinstated by The Sherwin-Williams Company, 101 Prospect Ave., N. W., Cleveland, Ohio, to fill the gap left by restrictions on Kem Lustral which is now obtainable only on priority. "A" Lustral is suitable for either indoor or outdoor use, and brush, spray, or dip application. It is being offered in the same range of colors as Kem Lustral at slightly lower cost.

At the same time a new color card has been announced for "B" Lustral Enamel which is somewhat more economical than "A" Lustral but is recommended primarily for interior use.

Unless further restrictions are placed upon the paint industry, both "A" and "B" Lustral Enamel can be supplied on non-priority orders.

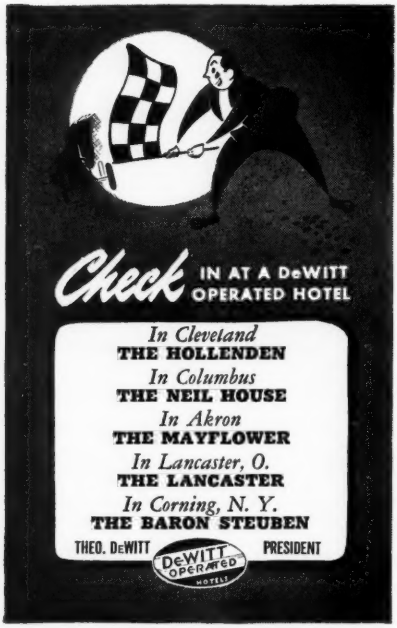
## Westco Drum Opener

A semi-automatic drum opener of simple construction, to be known as the Westco is announced by The Turner & Seymour Mfg. Co., Lawton St., Torrington, Conn. Easily and quickly operated, the unit is designed to eliminate injuries associated with the usual hammer and cold chisel method opening drums.



Westco Drum Opener

The Westco Drum Opener is designed to cut a smooth edged opening in straight-chime metal drums up to 35 inches in height. The corrugated cast iron base of the opener can be bolted to the floor. Four steel uprights support the cutting unit, which is counterbalanced for easy adjustment to the height of drum. After adjustment, the cutting unit is locked in position. By closing the cutting unit lever, the drum is perforated.



## Carbozite Shop Coat

A highly corrosion-resistant, quick

drying coating, known as Carbozite Shop Coat, for the protection of bright steel and similarly highly finished products during oversea shipment or any type of exposed shipment such as in river barges, open trucks and railroad gondolas, has been placed on the market by Carbozite Corporation, 906 First National Bank Bldg., Pittsburgh, Pa. The coating is a bituminous base material which dries in from 25 to 30 minutes and is said to resist the attacks of salt air or salt water, moisture, acid, alkali and sulfurous fumes and is easily applied by brushing, spraying, or dipping. Removal of Carbozite Shop Coat from the product after shipment is easily accomplished by wiping clean with a cloth saturated in any light petroleum solvent.

The serviceability of the coating is adequate for any shipping requirement and can be increased to any desired extent. The standard Carbozite Shop Coating, which is the quick drying type, deposits a protective skin about .002 in. in thickness which has proved ample to resist the most severe salt water exposure, according to the manufacturer. Heavier coatings with slower drying times, but having service life up to many years in length are also obtainable. As the basic materials of Carbozite Coatings are not directly strategic to war, priorities have not affected delivery when shipped in returnable containers.

The manufacturer states that a number of leading steel manufacturers are using Carbozite Shop Coat regularly to protect cold drawn bar stock, cold rolled or drawn strip, bright wire and machined parts.

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**Coffing Model Y-C Spur-Geared Chain Hoist.** Coffing Hoist Co., Danville, Ill., now has available a four-page folder illustrating and describing an improved ball bearing spur-geared chain hoist. Copy will be sent free upon request.

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**This Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:**

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**431 MAIN STREET, CINCINNATI, OHIO**

# FOR YOUR Catalog LIBRARY

*To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.*

**1. Lixol Metal Cleaner**

A solvent emulsion-type metal cleaner known as "Lixol" is described in a booklet which is now being issued by Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

**2. Data on Production Facilities**

The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, is now issuing a catalog containing an abundance of information on the facilities of this company which are available to those who require sheet metal fabrication.

**3. Heil Process Equipment**

The construction of process equipment with chemical resistant materials is described in a catalog now being issued by Heil & Company, 12903 Elmwood Ave., Cleveland, Ohio.

**4. "B" Lustral Enamel**

"B" Lustral Enamel, a finishing material recommended primarily for interior use, is described in a color chart which is now being issued by The Sherwin Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio.

**5. Metal Parts Cleaning Equipment**

Colt Autosan Metal Parts Cleaning Equipment is described in a 12-page catalog now being issued by Colt's Patent Fire Arms Mfg. Company, 1933 Van Dyke Ave., Hartford, Connecticut.

**6. Prep Products**

Four materials which help to provide a firm and lasting bond between all kinds of metal surfaces and paint finishes—known as Galvaprep, Prepwash, Preprite, and Metalprep—are described in a folder now being issued by Neilson Chemical Co., 6564 Benson St., Detroit, Michigan.

**7. Spray Booth Cleaning Compounds**

Triad WS and WSF spray booth cleaners for use respectively in booths where oil base paints and enamels are sprayed are described in a new leaflet issued by Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich. It tells how vital parts of spray booths may be kept from being fouled by paint pigments.

**8. Despatch Laboratory Ovens**

Bulletin No. 105, now being issued by Despatch Oven Company, 722 Central Ave., Minneapolis, Minn., describes fully a new line of Despatch Chemical Laboratory Forced Draft Ovens.

**9. Hard Chromium Plating**

A 16-page data bulletin summarizing the applications of industrial chromium plating is now being issued by United Chromium, Inc., 51 East 42nd St., New York City.

**10. Automatic Spray Finishing Machines**

A beautifully illustrated eight-page catalog showing automatic spray finishing machines for munitions and arms plants and for industry is now being issued by Spray Engineering Company, 114 Central St., Somerville, Massachusetts.

**11. Infra-Red Paint Drying Equipment**

Infra-Red Equipment Corp., 1225 W. Washington Blvd., Chicago, Ill., is now issuing a four-page bulletin designed to tell how infra-red rays can help paint drying.

**12. Scientific Metal Cleaning**

Four types of metal cleaners covering practically every metal cleaning operation are described in a bulletin which is now being issued by The DuBois Company, 1120 W. Front St., Cincinnati, Ohio.

**13. Tamms Paint Catalog**

Tamms Silica Co., 228 N. La Salle St., Chicago, Ill., is now issuing a 24-page catalog describing and illustrating the paints and builders' supplies manufactured by this company.

**14. Protex Non-Rust Oil**

A four-page folder now being issued by Wayne Chemical Products Co., Copeland at M.C. R.R., Detroit, Mich., describes Protex Non-Rust Oil, a coating which is said to provide protection for metal against rust damage.

**15. Metal Cleaning in War Time**

The Magnus Chemical Company, Inc., 208 South Ave., Garwood, N. J., manufacturer of industrial cleaning materials, emulsifying agents and metal working lubricants, is now issuing this new 50-page, illustrated handbook.

**16. Burring With the Lea Method**

An eight-page bulletin covering the Lea method of burring is now being distributed by Lea Manufacturing Co., 22 Cherry St., Waterbury, Connecticut.

**17. Brightboy for Polishing and Finishing**

An eight-page booklet describing Brightboy; what it is, what it does, is now being issued by Brightboy Industrial Division, Weldon Roberts Rubber Co., 351 Sixth Ave., Newark, New Jersey.

**18. New Facts About Infra-Red**

A revised brochure issued by the Ault & Wiborg Corporation, 75 Varick St., New York, N. Y., is now available to manufacturers who want information on the use of infra-red to bake industrial finishes.

**19. Acid-Proof Pipe and Fittings**

The United States Stoneware Co., Akron, Ohio, is now publishing a 12-page catalog complete with descriptions and photographs covering acid-proof piping.

**20. Lin-Tite Plastic**

A modern method of tank lining and surface conservation provided by Lin-Tite Plastic is described in a 12-page catalog which is now being issued by Adolphe Hurst & Co., 330 W. 12nd St., New York City.

**21. Incendiary Bomb Coating Units**

Semi-automatic air painting units for coating interiors of incendiary bombs, 20 mm., 37 mm., and 40 mm. shells are described in a bulletin designated as F2-42 now being issued by Paasche Airbrush Co., 1910 Diversey Pkwy., Chicago, Illinois.

**22. Black-Magic Products**

Five Black-Magic metal finishes are described in a catalog which is now being distributed by The Mitchell-Bradford Chemical Co., Seymour St., off Bruce Ave., Bridgeport, Connecticut.

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